BROADBENT & TABB
RADIO OUTFITS OF ALL KINDS
ANYTHING ELECTRICAL
MIFFLIN, PA.

Federal

Telephone & Telegraph Co.

MANUFACTURERS
TELEPHONE, TELEGRAPH AND RADIO APPARATUS AND ACCESSORIES

FACTORY AND HOME OFFICE
Buffalo, New York, U. S. A.

BULLETIN 130-W — OCTOBER 10, 1923

RADIO TELEGRAPH AND TELEPHONE APPARATUS

BROADBENT & TABB
RADIO OUTFITS OF ALL KINDS
ANYTHING ELECTRICAL
MIFFLIN, PA.

Home of Federal Radio Apparatus

BROADBENT & TABB
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MIFFLIN, PA.

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Foreword

FOR over twenty-three years **FEDERAL** has been building communication equipment in all its many phases. It has built and operated numerous telephone systems throughout this country and has supplied every part of the world with telephone equipment. From its extensive activities in the field of communication apparatus **FEDERAL** has learned that any apparatus that is to be used for the transmission of intelligence, cannot be made too well, and in the design and the construction of **FEDERAL** radio equipment during the last seven years, it has applied all the well learned lessons of its telephone experience.

FEDERAL has learned that effective and reliable equipment can only be designed by engineers of broad training and wide experience. **FEDERAL** has learned that useful products can be built up only of the most carefully chosen material and through the use of the highest mechanical skill. **FEDERAL** has learned that all these essentials to the manufacture of the highest grade of apparatus can only be secured by the gathering together of men of unquestioned integrity and the widest kind of experience for the performance of every step in the process which interlinks the conception of its devices with the final merchandising of these. **FEDERAL** has learned that only by making the work of each individual in this long chain congenial and interesting can the high standards of the **FEDERAL** Organization be maintained. **FEDERAL** has been so successful in its recognition of these basic principles and their application both to **FEDERAL** personnel and product that at this time **FEDERAL'S** reputation for unquestioned superiority is maintained by practically the same organization that has upheld **FEDERAL'S** most enviable reputation throughout the last twenty-three years.

Behind **FEDERAL'S engineering ingenuity, FEDERAL'S** manufacturing skill and **FEDERAL'S** discerning merchandising policy stands the millions of dollars of **FEDERAL** wealth guaranteeing the perpetuation of **FEDERAL** standards.

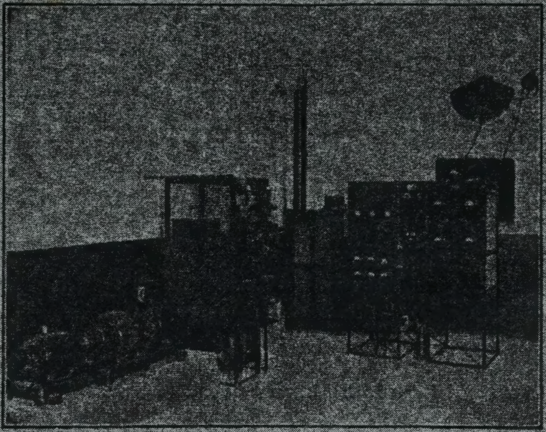
Federal Telephone and Telegraph Co.

Federal · Standard · Radio · Products

Guarantee

We hereby guarantee Federal Standard Radio Products to be free from all mechanical and electrical defects, and to function properly when installed in accordance with our authorized directions and we agree to replace, at our expense, any unit or part which may prove defective.

INTERIOR NEW STUDIO



TRANSMITTING APPARATUS

RADIOPHONE WGR

Owned and Operated by the

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Located at

HOTEL STATLER BUFFALO, N. Y.

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All goods are carefully inspected and tested before shipment is made.

We cannot guarantee safe delivery, but take every care in packing on all shipments. All claims for breakage in transit, to be taken up with the carrier.

Unless customers specify route by which goods are to be shipped, we will use our own discretion and ship by the most convenient way.

We cannot guarantee our apparatus against ill or improper use.

SPECIAL NOTE TO MANUFACTURERS

The sturdy, rugged, sensitive efficiency of your completed apparatus and its intrinsic value, will be enhanced to an appreciable extent by the use of **FEDERAL** Radio instruments, which are the latest thought and development in apparatus design and construction.

FEDERAL'S vast resources and facilities for production permit us to make attractive prices and insure uninterrupted deliveries.

We solicit your business on your requirements.

Federal Telephone and Telegraph Co.

Buffalo, N. Y.

one stage of radio frequency amplification and two stages of audio frequency amplification will suffice for the reception of almost all the American broadcasting stations under best weather conditions. It is to be borne in mind that the mere addition of more amplification may not be depended upon to increase the range of reception of the radio receiver. This peculiar condition is brought about by the presence of electrical atmospheric disturbances or "static" over the entire surface of the earth and in space far beyond the surface of the earth. It is obvious that the higher the degree of amplification used in the radio receiver the greater will be the area of the earth's surface over which signals may be received and hence the greater will be the amount of the atmospheric disturbances which are being simultaneously received. Once sufficient sensitiveness has been secured through the use of amplification to make the intensity of the static, which is being received, as great as that of the signals, which are being received, any further amplification will merely serve to augment the static in a greater degree, perhaps, than it does the signal with a consequent reduction in the usefulness of the radio receiving system.

Where neither of the two described types of antennae can be erected it becomes necessary to use either a very restricted indoor antenna such as a wire concealed about the room or else a loop antenna, consisting of a large coil of wire but, in either event, the reduction in the size of the antenna must be compensated by a greater degree of amplification. However, since the greatest degree of amplification which can be secured is quite definitely limited by the greater difficulty of securing quiet and satisfactory operation of the amplifier as the number of stages of amplification become greater, the use of a very small antenna must of necessity limit the range over which signals can be received and the intensity with which they may be reproduced. Not only does this limiting of the receiving range and signal intensity make the use of the very small antenna or loop objectionable, but added to this inherent limitation is the fact that the first cost of the apparatus required for operaion with the loop or the very small antenna is, of course, much greater; the cost of its maintenance and operation such as vacuum tube replacement, storage battery charging, plate supply battery replacement, all make the use of the loop or small indoor antenna far more expensive than the operation of the large outdoor or even the generous indoor antenna and for these reasons the more restricted antennae should be resorted to only when the other types of antennae are quite impossible. An antenna for the reception of broadcast signals may be constructed as shown in Fig. 1. It should be supported **as high above ground as possible,** (35 or more feet from ground) and its length should not be less than 75 ft., nor more than 160 ft. where a single wire is used. Several wires secured to wooden spars may, of course, be substituted for the simple single wire antenna, and where such an antenna is used, it may be shorter than the single wire antenna.

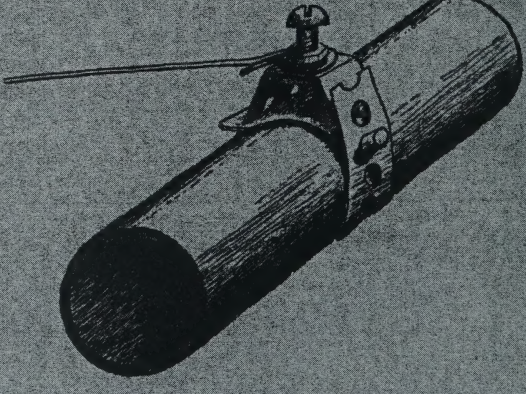
A sturdy copper wire should be used for the antenna conductor. This should not be smaller in size than No. 16 B. & S. gauge, and the antenna should, be free of joints in the conductor. Where it is found impossible to make the antenna of one continuous piece of copper wire from its remote end to the apparatus, the joint should be carefully soldered and then protected against corrosion, by securely wrapping with tape. That part of the antenna conductor which connects the elevated portion of the antenna and the receiver, should be as short as it is possible to make it. Where it passes through the walls of the house use should be made of a porcelain or other insulating tube, and wherever it is supported it should be secured to porcelain or other insulators.

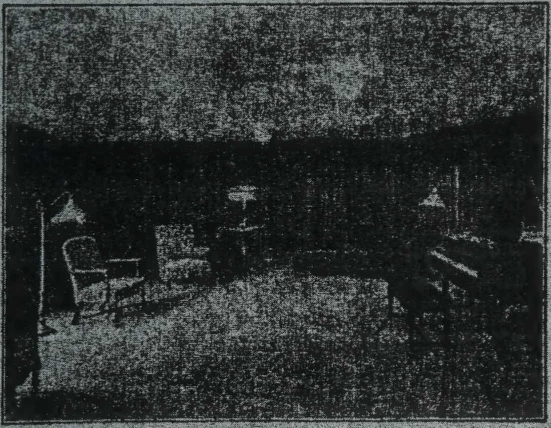
THE GROUND

The connection to the ground can best be made by providing a secure electrical contact to the water pipe, as near to the underground pipe system as possible. For best operation it will be found that connection should be made to the pipe which leads from the water meter to the street, and this connection can be made most conveniently by means of a ground clamp as shown in Fig. 2. The connection from ground clamp to the receiver should be made with a sturdy copper conductor not smaller than No. 16 B. & S. gauge, run in as direct and short a line as feasible.

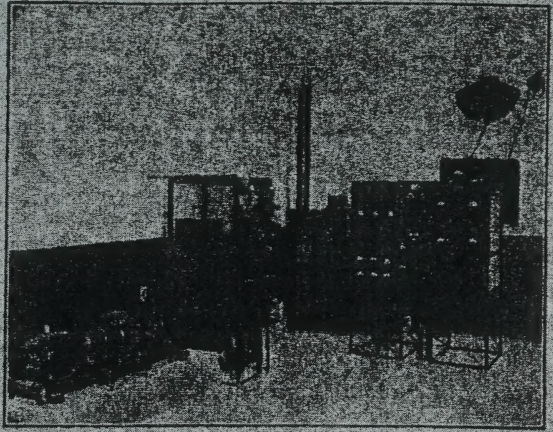
It is advisable, that this conductor be insulated, as is the antenna conductor, on porcelain or other types of insulators. Where it is impossible to make connection to the water system as described above, connection may be made to other portions of the water system, to gas pipes where they are available, heating system pipes or to the metal structure of the building. These are given in the order of their preference, but it will be found that in any installation the cost and difficulty of making connection to the water system as described will be found well justified in the increased distance over which reception is possible.

It it is to be borne in mind that in making connection by means of a ground clamp, it is necessary that the pipe to which connection is made, be cleaned of all corrosion, and that the bright metal be exposed to contact with the ground clamp; that the ground clamp be very tightly secured to the pipe, and that the copper connecting wire be scraped bright and clean, and then very securely fastened to the ground clamp. **The expenditure of care in the proper laying out of the antenna and ground system will repay itself many times in the increased range of reception and the greater reliability in the operation of the receiving apparatus.**





INTERIOR NEW STUDIO



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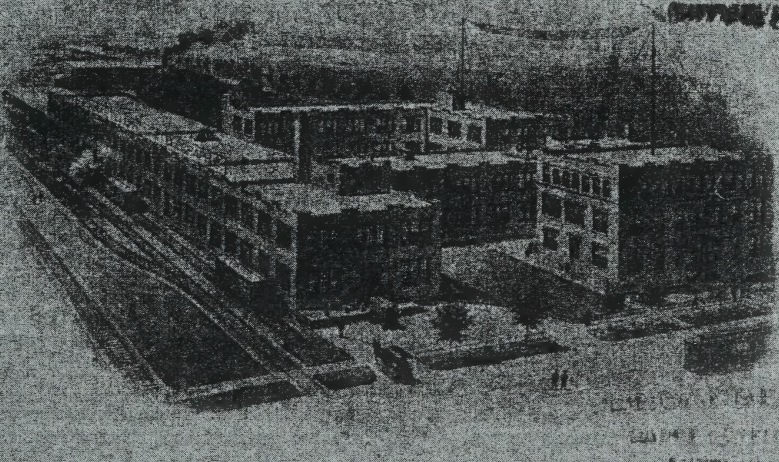

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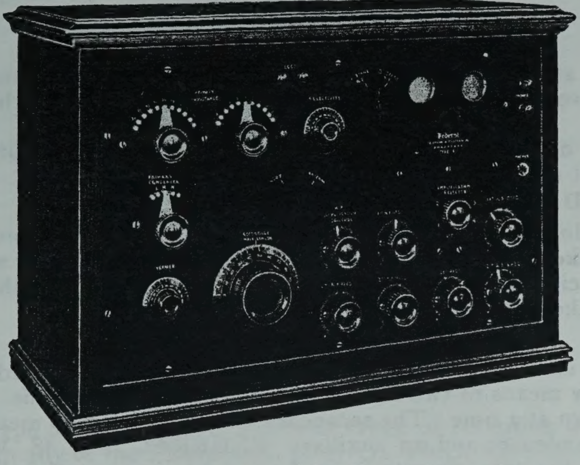
TYPE 61 RECEIVER



The **FEDERAL** Type 61 has a greater breadth of usefulness than any other of **FEDERAL'S** receivers. It may be used with equal effectiveness with a small or large loop antenna, a small indoor wire, or the more common large outdoor antenna systems and when used with any of these types of signal pickup systems, will give a range of reception of such magnitude as to make available almost all American broadcasting. It secures its great range and flexibility through the use of its three stages of radio frequency amplification in combination with two stages of audio frequency amplification and through a unique switching system, which gives an exceptionally great variation of the degree of amplification, it has an extremely wide range.

It is so constructed that when used with an antenna it is, in effect a very selective and extremely sensitive two tuned circuit receiver while when used with a loop it becomes a single tuned circuit receiver. The change from one type of receiver to the other is accomplished through the simple turning of a single switch.

Practically every position of the circuit is provided with separate controls thus making it possible to operate all parts of the device at the utmost efficiency.

By careful choice of the controlling mechanism and the arrangement of parts, the operation of the controls is made quite independent so that the manipulation of any control may be accomplished without any reaction on the remaining controls. This makes possible the operation of the receiver at a high degree of effectiveness without any previous familiarity with the device and makes the manipulation of the controls to bring about maximum possible effectiveness possible after only an extremely limited experience with the device.

The face of the receiver is a highly polished black bakelite panel upon which all control knobs are of a similar material while all exposed metal parts are of highly polished nickel. The mahogany cabinet which houses the receiver is finished in a luxurious dark brown mahogany with a delightful satin surface. It will retain its beautiful finish indefinitely and requires only the most infrequent dusting or polishing.

The terminals for the connection of all auxiliaries such as antenna, ground, batteries, etc., are mounted inside the cabinet so that all connecting wires are concealed from view.

SPECIFICATIONS

ANTENNA

The receiver will operate on all types of antennas ranging from the indoor loop or open wire antenna to the large, high, outdoor antenna system. The adjustment of the receiver to suit any particular antenna is accomplished through the use of two simple switches.

TUBES

Any of the commonly available vacuum tubes may be used with the receiver. This is made possible through both the circuit design and through the use of the No. 27 rheostat, which provides control for any tube filament current between the limits of the very small current required by the UV-199 tube to the much higher current required by the UV-200 vacuum tube.

BATTERIES

Any type of dry or storage battery may be used with the receiver, since the No. 27 rheostats with which it is provided allows the control of any battery voltage between two and six volts.

Individual control of the filament current of each vacuum tube is provided through the use of a No. 27 filament rheostat for each of the six tubes.

TELEPHONES OR LOUD SPEAKER

The telephone binding posts and telephone jack provide for the connection of any type of head set or loud speaker the connecting cords of which are equipped with either plug or plain terminals. A special pair of terminals are also provided inside the set for the connection of the loud speaker.

TUNING SYSTEM

The tuning system consists of two variable inductively coupled tuned circuits. The antenna circuit is tuned by means of two inductance switches, whereby the inductance may be very slowly varied, a turn at a time. The secondary circuit is tuned by means of a **FEDERAL** No. 45 Variable Air Condenser and an auxiliary **FEDERAL** No. 48 Vernier Condenser. The coupling between the two circuits is made variable in exceptionally minute steps so that a very close control of the selectivity of the receiver is easily possible. Through the turning of a switch the receiver is changed to a single tuned circuit device which employs a loop antenna.

RADIO FREQUENCY AMPLIFIER

The R. F. Amplifier consists essentially of three **FEDERAL** R. F. Transformers and will perform very effectively with any of the many vacuum tubes over the entire band of broadcast wavelengths,—225 to 550 meters. It is provided with an R. F. Amplification Control whereby the degree of amplification is made variable between wide limits.

AUDIO FREQUENCY AMPLIFIER

The A. F. Amplifier consists essentially of **FEDERAL** amplifying transformers and will operate with any of the available vacuum tubes to give an extraordinarily high degree of amplification combined with a pureness and faithfulness of reproduction unrivaled by any other type of amplifier. It is provided with an A. F. amplification control, whereby the degree of amplification may be varied between wide limits.

TUBE MOUNTING

The six vacuum tube sockets are securely mounted on a suspension of elastic material, making the whole receiver proof against shock and eliminating the tube noises inherent in any other type of mounting.

PANEL

The panel is of the highest grade of phenol condensation material with the controls arranged in such symmetry as to give a well balanced and beautiful assembly.

CABINET

The cabinet, which is of mahogany, finished in a very dark brown, is beautiful, both in its proportions and its finish and its color is such that it blends most harmoniously with either a setting of mahogany or walnut furniture. The cover of the cabinet opens conveniently upward exposing the internal mechanism of the receiver and makes the connection of all auxiliaries and the insertion or removal of vacuum tubes most conveniently and easily accomplished.

DIMENSIONS

Cabinet		Panel	
Height,	16¾ Inches.	Height,	12½ Inches.
Width,	24¼ Inches.	Width,	21 Inches.
Depth,	12⅜ Inches.		

Net Weight, 35 lbs.

Type 61 Receiver (with head set) .... each, **$223.00**

TYPE 59 RECEIVER

The **FEDERAL** Type 59 Receiver has a greater range of reception and a more beautiful reproduction of music than any of the **FEDERAL** receivers which have been produced in the past for use primarily with antennas. Through its use practically all the broadcasting on the American continent is made available under good conditions and the entertainment which may be secured through its remarkable faithfulness of tone reproduction makes it a device of infinite utility. In addition to its tremendous receiving range, it makes possible, through its exceptionally precise tuning qualities, almost a complete elimination of all but the broadcasting of the desired station and it does this with the simplest kind of manipulation and adjustment.

It gains its tremendous range of reception through the use of painstaking circuit design and the choice of the finest kinds of materials, fabricated with the most careful workmanship.

It is essentially, a two-circuit receiver with variable inductive coupling between the circuits in connection with a combination radio and audio frequency amplifier, consisting of one stage of **FEDERAL** Radio Frequency amplification and two stages of **FEDERAL** Audio Frequency amplification. It combines in itself, a rare degree of ease and simplicity of operation with a degree of effectiveness unique to itself. Sufficient controls are provided so that the utmost in receiving range may be secured under very careful manipulation, while the choice and arrangement of parts and the lack of interdependence of controls is such that a more casual manipulation of the receiver will still give a greater range of reception than has been heretofore available by apparatus more complicated than the **FEDERAL** Type 59.

The entire receiver is mounted on a polished bakelite panel with all exposed metal finished in highly polished nickel, and the entire unit is mounted in a beautifully polished dark mahogany cabinet. Provision is made for the connection of batteries, antenna and ground by a special set of terminals mounted inside the cabinet, making it possible for the connection of all auxiliaries with the connecting wires wholly concealed.

The highly polished black of the panel, as contrasted with the rich satin finished mahogany cabinet makes the receiver a device of unquestioned beauty and one which will always constitute a suitable addition to any type of home furnishings.

Below are given brief descriptions of the various parts of the device:

ANTENNA

The receiver will operate on any type of antenna, from the indoor wire to the large, high, outdoor antenna system, the adjustment of the receiver to suit any particular antenna being provided through the use of the Primary Condenser switch.

TUBES

Any of the commonly available vacuum tubes may be used with the receiver. This is made possible through both the circuit design and through the use of the No. 27 rheostat, which provides control for any tube filament current between the limits of the very small current required by the UV-199 tube to the much higher current required by the UV-200 vacuum tube.

BATTERIES

Any type of dry or storage battery may be used with the receiver, since the No. 27 Rheostats with which it is provided allows the control of any battery voltage between two and six volts.

Individual control of the filament current of each vacuum tube is provided through the use of a No. 27 filament rheostat for each of the four tubes.

TELEPHONES OR LOUD SPEAKER

The telephone binding posts and telephone jack provide for the connection of any type of head set or loud speaker, the connecting cords of which are equipped with either plug or plain terminals. A special pair of terminals are provided inside the set for the connection of the loud speaker.

TUNING SYSTEM

The tuning system consists of two variable inductively coupled tuned circuits. The antenna circuit is tuned by means of two inductance switches, whereby the inductance may be very slowly varied, a turn at a time. The secondary circuit is tuned by means of a **FEDERAL** No. 45 Variable Air Condenser and an auxiliary **FEDERAL** No. 48 Vernier Condenser. The coupling between the two circuits is made variable in exceptionally minute steps so that a very close control of the selectivity of the receiver is easily possible.

RADIO FREQUENCY AMPLIFIER

The R. F. Amplifier consists essentially of the No. 35 **FEDERAL** R. F. Transformer and will perform very effectively with any of the many vacuum tubes over the entire band of broadcast wavelengths,—225 to 550 meters. It is provided with an R. F. Amplification Control whereby the degree of amplification is made variable between wide limits.

AUDIO FREQUENCY AMPLIFIER

The A. F. Amplifier consists essentially of **FEDERAL** amplifying transformers and will operate with any of the available vacuum tubes to give an extraordinarily high degree of amplification combined with a pureness and faithfulness of reproduction unrivaled by any other type of amplifier. It is provided with an A. F. amplification control, whereby the degree of amplification may be varied between wide limits.

TUBE MOUNTING

The four vacuum tube sockets are securely mounted on a suspension of elastic material, making the whole receiver proof against shock and eliminating the tube noises inherent in any other type of mounting.

PANEL

The panel is of the highest grade of phenol condensation material with the controls arranged in such symmetry as to give a well balanced and beautiful assembly.

CABINET

The cabinet, which is of mahogany, finished in a very dark brown, is beautiful, both in its proportions and its finish and its color is such that it blends most harmoniously with either a setting of mahogany or walnut furniture. The cover of the cabinet opens conveniently upward exposing the internal mechanism of the receiver and makes the connection of all auxiliaries and the insertion or removal of vacuum tubes most conveniently and easily accomplished.

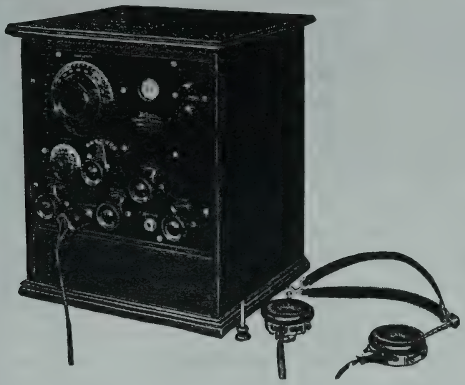
DIMENSIONS

Cabinet	Panel
Height, 15¾ Inches.	Height, 11½ Inches.
Width, 22¾ Inches.	Width, 19½ Inches.
Depth, 11¼ Inches.	

Net weight, 29 lbs.

Type 59 Receiver (with head set) ....each, **$177.00**

TYPE 110 RECEIVER



The **FEDERAL** Type 110 Receiver combines with a remarkable simplicity of operation a compactness of parts, a range of reception and beauty of music reproduction heretofore impossible of attainment in so small and modest a radio receiver. When used with almost any type of antenna it requires frequent manipulation of only one or, at most, two controls for its operation at maximum effectiveness and when used with reasonable care in its manipulation will bring in signals over startling great ranges with a beauty of tone quality that is indeed surprising to the user. It is especially suited for use with dry battery tubes and provision is made for the housing of the dry batteries within the receiver so that it constitutes a portable but still long range receiver.

Notwithstanding the simplicity of its controls, the degree with which it is possible for the user to tune in the desired station and eliminate the undesired station is such that with the present allocation of broadcasting wavelengths no serious interference between broadcasting stations need occur.

The quality of the units entering into its construction is identical to that in our higher priced receivers. The workmanship and finish throughout is in no way inferior to the high standards of our types 59 and 61. Every effort has been made to make this model the most popular radio receiver ever offered the public. The extremely low price set upon a device in which are incorporated all of the latest developments of our laboratories makes it the greatest value of any radio receiver appearing on the market. The spontaneous reception which will be given this receiver will make the low list price justifiable because of the lowered costs due to quantity production. Yet, the same skilled workmen and inspectors employed in the production of our more elaborate receivers will assure the same unsurpassed mechanical and electrical qualities that have given so much prestige to **FEDERAL** radio products.

The extreme sensitivity of this device has been made possible by painstaking development covering a period of many months. Our engineers have scrupulously studied the effects of the nature and location of the units to produce a harmony which has resulted in unprecedented efficiency and positiveness of control. Every unit entering into its construction is produced in our own factory where direct engineering supervision during the production of each component part is assured.

SPECIFICATIONS

ANTENNA

The receiver will operate on any type of outdoor antenna, the adjustment of the receiver to suit any particular antenna being provided through the use of the selectivity switch.

TUBES

Any of the commonly available vacuum tubes may be used with the receiver. This is made possible through both the circuit design and through the use of the No. 27 rheostat which provides control for any tube filament current between the limits of the very small current required by the UV-199 tube to the much higher current required by the UV-200 vacuum tube.

BATTERIES

Any type of dry or storage battery may be used with the receiver, since the No. 27 Rheostats with which it is provided allows the control of any battery voltage between two and six volts. Individual control of the filament current of each vacuum tube is provided through the use of a **FEDERAL** No. 27 rheostat for each of the three tubes.

TELEPHONES OR LOUD SPEAKER

The telephone binding posts and telephone jack provide for the connection of any type of head set or loud speaker the connecting cords of which are equipped with either plug or plain terminals.

TUNING SYSTEM

The tuning system is especially devised for ease of operation. It has the simplicity of the ordinary single circuit tuner and combines in addition, a degree of selectivity not found in the usual single circuit receiver. In tuning, the one major control provides for the change of wavelength of the receiver. This control in connection with the **FEDERAL** Vane Vernier gives an exceedingly gradual change of wavelength. The five selectivity taps provide five different values of selectivity, giving a flexibility which makes it possible to operate the receiver with a low or high degree of selectivity at any wavelength.

RADIO FREQUENCY AMPLIFIER

The R. F. Amplifier consists essentially of the No. 35 **FEDERAL** R. F. Transformer and will perform very effectively with any of the many vacuum tubes over the entire band of broadcast wavelengths,—225 to 550 meters. It is provided with an R. F. Amplification Control whereby the degree of amplification is made variable between wide limits.

AUDIO FREQUENCY AMPLIFIER

The A. F. Amplifier consists, essentially, of a **FEDERAL** No. 65 Amplifying transformer and will operate with any of the available vacuum tubes to give an extraordinary high degree of amplification combined with a pureness and faithfulness of reproduction unrivalled by any other type of amplifier.

TUBE MOUNTING

The three vacuum tube sockets are securely mounted on a suspension of elastic material, making the whole receiver proof against shock and eliminating the tube noises inherent in any other type of mounting.

PANEL

The panel is of the highest grade of phenol condensation material with the controls arranged in such symmetry as to give a well balanced and beautiful assembly.

CABINET

The receiver is mounted in a wooden cabinet of excellent design, finished in a dark brown mahogany which blends perfectly with either mahogany or walnut. The cabinet is of such dimensions that it will accommodate four dry cell "A" Batteries and three small sized "B" batteries.

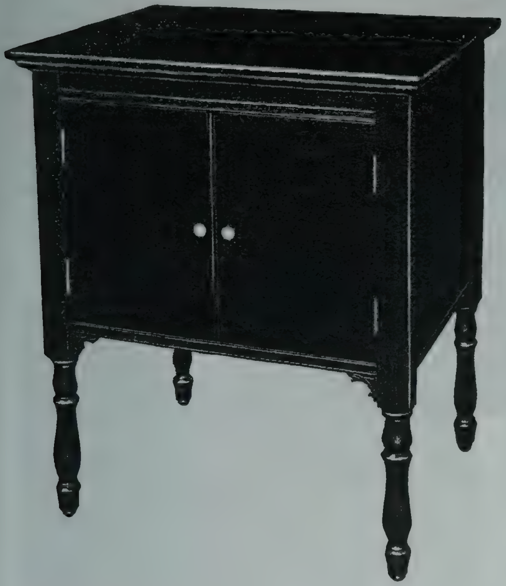
DIMENSIONS

Cabinet		Panel	
Height,	14½ Inches.	Height,	9½ Inches.
Width,	13¼ Inches.	Width,	11 Inches.
Depth,	11¼ Inches.		

Net weight, 17 lbs.

Type 110 Receiver (with head set) ....each, $105.00

BATTERY CABINET



The **FEDERAL** No. 175 Battery Cabinet is especially designed for the radio enthusiast who wishes to locate his batteries close to his radio receiver in such a form as to substitute for the unsightliness of exposed batteries and connecting wires, a housing for his batteries that has both beauty and a rare degree of utility. This battery cabinet is built up of mahogany of warm brown color and finished with a satin-like finish of extraordinary beauty and remarkable durability.

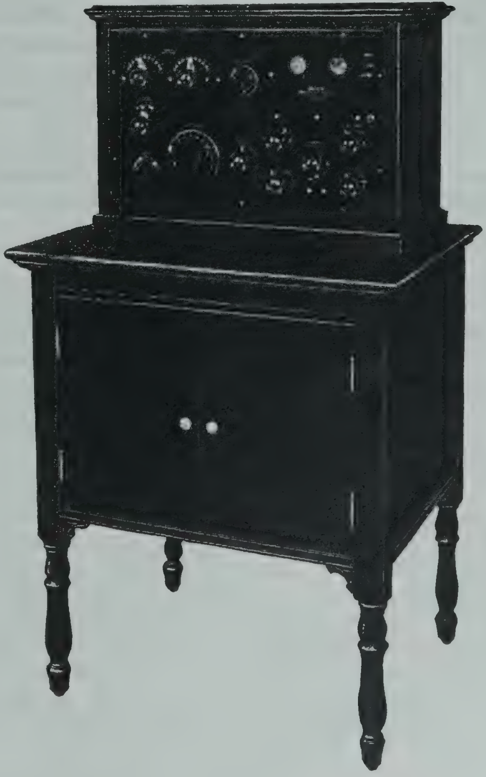
Sufficient space is provided inside of the cabinet for housing any type of filament and plate supply batteries. If these batteries are properly arranged a battery charging device may be housed in the cabinet with the batteries, thus making the battery cabinet a complete power supply system in itself. Any type of receiving equipment may be mounted on this cabinet but it is especially suited for use with the **FEDERAL** Types 59 and 61 Receivers.

Eyelets are provided at the rear of the top through which the wires are run from the batteries to the receiver. Corresponding eyelets are provided in the bottom of Types 59 and 61 Receivers so that connection may be made between batteries and the terminal block of these receivers. Thus the wires are kept within the cabinet and are not visible from the outside. Two bolts with flanged thumb nuts are furnished with each battery cabinet and holes are provided in the base of the receivers in order that either Type 59 or 61 Receiver may be securely fastened to the cabinet. When either type of receiver is used in connection with the No. 175 Battery cabinet and the batteries and charging equipment are housed inside, the whole appearance is charmingly simple and agreeable.

The interior of the cabinet is easily accessible through two doors, each ten inches in width and fourteen inches in height.

DIMENSIONS

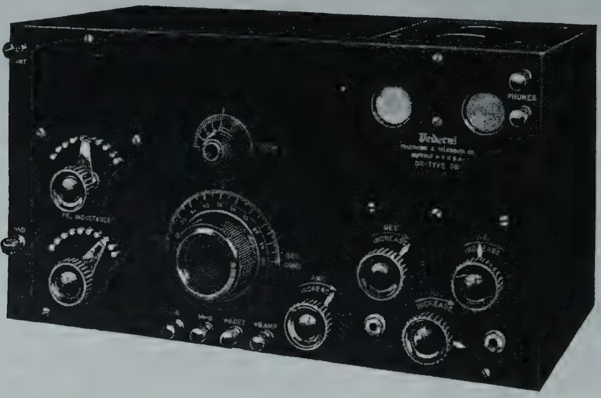
	Inside			Top	
Height,	16½	Inches.	Depth,	19⅝	Inches.
Width,	22	Inches.	Width,	26	Inches.
Depth,	17	Inches.			
	Outside				
Height,	30¾	Inches.			
Width,	24	Inches.			
Depth,	18¾	Inches.			
	Legs				
Height,	12⅞	Inches.			



Type 59 Set Used With No. 175 Cabinet.

No. 175 Battery Cabinet ....each, $51.00

D. X. TYPE 58 RECEIVER



The **FEDERAL** **D. X.** receiver is especially suited for use where a receiver is desired that is more selective than is the single tuned circuit receiver, **FEDERAL** No. 57. The greater selectivity of the **FEDERAL** D. X. receiver is secured through the use of two tuned circuits provided with controls which make it possible by a series of simple adjustments to secure a degree of selectivity quite exceptional for a receiver as simple in operation as the **FEDERAL** D. X.

The receiver is exceedingly sensitive and makes reception possible over ranges greater than can be accomplished with the more ordinary means of amplification.

It may be used for the reception of broadcast radio telephone signals with almost any type of antenna.

The tuning circuit consists of an antenna tuning inductance, a secondary circuit inductance, with variable inductive coupling between the two inductances, and a secondary circuit tuning condenser. The antenna circuit inductance is equipped with inductance switches which allow a very exact tuning of the antenna circuit while the secondary circuit condenser allows of precise tuning of that circuit.

The coupling between the circuits is variable between very wide limits and makes possible adjustment of the receiver to almost any degree of selectivity.

The amplifying system consists of one stage of radio frequency amplification, a detector tube and two stages of Audio Frequency Amplification.

The R. F. Amplification of which this receiver is capable is exceptionally high and results from the use of the **FEDERAL** No. 35 radio frequency amplifying transformer, which is supplied with the receiver, in conjunction with a UV-201A vacuum tube or its equivalent. The two stages of audio frequency amplification, which so greatly augment the amplification made available through the R. F. amplifying transformer, is accomplished through the use of the **FEDERAL** 226 audio frequency amplifying transformers in conjunction with UV-201A vacuum tubes or their equivalents. Provision is made for the use of a sensitive detector tube such as the UV-200 vacuum tube. The wavelength range of the receiver is from 225 to 550 meters.

Control knobs are supplied for the adjustments of the primary antenna circuit inductance, primary-secondary coupling, and secondary condenser. An amplification control knob allows the variation of the amplification between wide limits and separate filament control rheostats, allow careful adjustment of the filament currents of individual vacuum tubes.

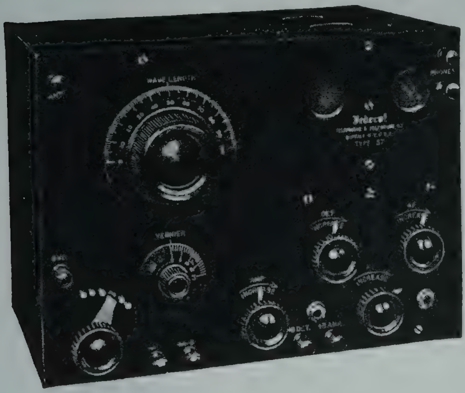
Such parts as tube sockets, filament rheostats, filament control jacks, etc., are standard high quality products and each contributes its share to making a device unrivalled in quality of material and workmanship.

The entire unit is mounted on a polished panel of phenol condensation material which is assembled in a metal case, finished in dull black enamel. The receiver as a whole is a device of remarkable beauty of line and finish as well as one of unrivalled effectiveness. Overall dimensions 17½" x 9¼" x 8¼".

D. X. Type 58 Receiver (with head set) .... each,	**$123.00**

TYPE 57 RECEIVER

The **FEDERAL** Type 57 Receiver combines with its simplicity and reliability of operation, an extraordinarily high degree of amplification and sensitivity. It gives this degree of amplification with the same pureness of tone and beauty of reproduction that has characterized the simpler and less sensitive types of **FEDERAL** Receiving equipment. Its extreme sensitiveness makes it especially valuable for use with small outdoor antennas, or for reception where a good outdoor antenna is not available and use must be made of indoor antenna.



Type 57 Receiver

The exceptionally simple operation is secured through careful design of its tuning system and through the use of radio frequency amplification, in addition to its two stages of audio frequency amplification, all of which are integral parts of the receiver.

It consists essentially of a tuning system and a vacuum tube amplifier of unique design. The tuning system is so proportioned as to allow of broadcast reception when used with a wide variety of antennas. It will serve for such reception not only with large antennas commonly used for this purpose, but may be used where available space or other limitations make small and ordinarily insignificant antennas necessary.

Through the use of the extraordinary sensitive amplifier it will make possible the reception of signals over distances that are utterly inaccessible when use is made of types of equipment other than those including radio frequency amplification.

The tuning system is of the single tuned circuit type, crude adjustment of the wave length being accomplished by means of a single large control knob while extremely minute adjustment of wave length is secured through the use of an exceedingly sensitive vernier control. Provision is made through a conveniently located switch for the adjustment of the receiver to suit the antenna and when this adjustment is once made, it requires little further attention.

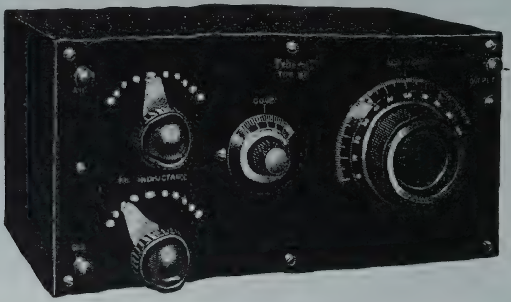
The amplifier includes one stage of radio frequency amplification, a detector tube and two stages of A. F. Amplification. The radio frequency amplification is accomplished by means of the **FEDERAL** No. 35 transformer which is supplied as an integral part of the receiver and is especially designed to give maximum possible amplification throughout the broadcast wavelength band, 225 to 550 meters. The audio frequency transformers are the standard **FEDERAL** No. 226 transformers, and all other parts such as tube sockets, rheostats, etc., are standard, high quality, **FEDERAL** products. The entire amplifier is controlled by three filament rheostats which allow separate control and careful adjustment of the tube filaments.

An amplification control is provided whereby the amplification may be varied very widely for reception on any wave length or in connection with any antenna with which the set may be used and is particularly useful in short distance reception, for limiting the degree of amplification of signals that are too loud for comfortable reception.

Overall dimensions of the receiver are 13″ x 9¼″ x 8¼″.

Discontinued. Description retained for benefit of trade.

No. 60 TUNER



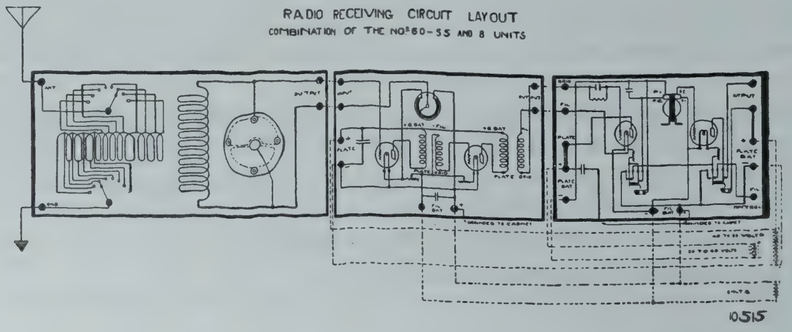
The No. 60 **FEDERAL** tuner is probably the most selective and efficient tuner available for use in broadcast reception. It is designed for use with a wide variety of antennae, from the small low single wire that has come into such common use, to the large, well-made amateur antenna, and when used with these antennae, will operate throughout the broadcast wavelength band. With it may be used any type of detector, either vacuum tube or crystal, in conjunction with either radio frequency or audio frequency amplification. It is especially effective, however, when used with the **FEDERAL** R. F. amplifying units, and when used in this connection constitutes what is undoubtedly the most sensitive and probably the most selective radio receiver yet devised for the radio listeners.

The tuner is of the two tuned circuit type, consisting of an antenna inductance system provided with inductance variation switches so that extremely fine tuning of the antenna circuit may be accomplished and with a secondary inductance system which is tuned by means of a variable air condenser. In addition to the controls provided for the variation of the antenna and secondary circuit tuning, a control is provided for the very fine variation of coupling between the two circuits. Large, conveniently placed knobs make precise variation of these several controls quite easily accomplished and the metal shielding with which the instrument is provided, completely eliminates body effects.

The entire unit is included in a metal cabinet finished in a rich dull black, all exposed parts being finished in polished nickel, while the panel is of highly polished insulating material. All component parts are standard high quality **FEDERAL** products.

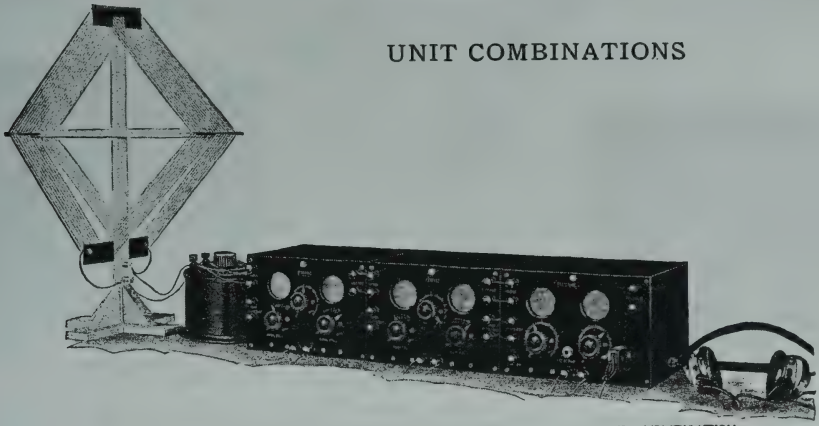
Its size is chosen so as to make it part of the **FEDERAL** line of unit type equipment and when used with other **FEDERAL** Units, its beauty of line and finish is exceeded only by its extraordinary electrical effectiveness.

No. 60 Tuner .... $42.00 each

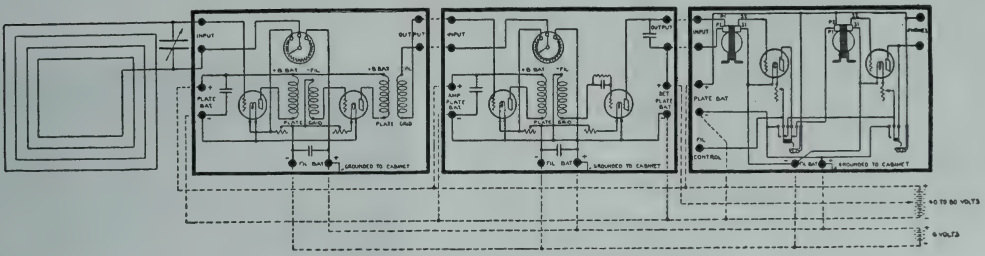


RADIO RECEIVING CIRCUIT LAYOUT
COMBINATION OF THE NO.S 60-55 AND 8 UNITS

UNIT COMBINATIONS



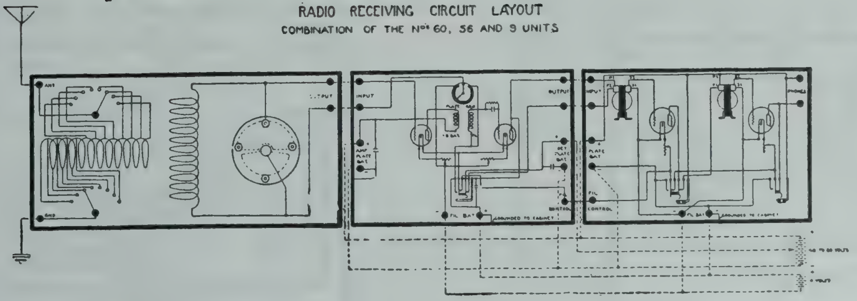
3 STAGES R.F. AMPLIFICATION-DETECTOR-2 STAGES A.F. AMPLIFICATION
LOOP RECEIVER



DIMENSIONS OF LOOP ANTENNA

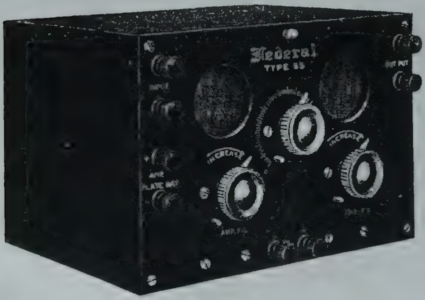
No. 18 S. C. C. WIRE

Length of Side of Squares	Number of Turns	Spacing	Type of Condenser	Wave Length Range
15 inches	18	⅛ inch	Federal No. 82	250-550
30 inches	12	⅜ inch	Federal No. 82	250-600
36 inches	9	½ inch	Federal No. 82	200-450
72 inches	4	¼ inch	Federal No. 82	200-450
96 inches	3	½ inch	Federal No. 82	250-450



RADIO RECEIVING CIRCUIT LAYOUT
COMBINATION OF THE Nos 60, 56 AND 9 UNITS

R. F. AMPLIFYING UNITS



No. 55 Two Stage R. F. Amplifier

The No. 55 and No. 56 **FEDERAL** Radio Frequency Amplifying Units are of the same high quality of material and workmanship as their companion units, the commonly used Audio Frequency Amplifying Units No. 8 and No. 9.

The No. 56 Unit consists of one stage of Radio Frequency Amplification and one vacuum tube detector while No. 55 unit consists of two stages of Radio Frequency Amplification.

The standard No. 40 **FEDERAL** Radio Frequency Amplifying Transformer Mounting is included in both these units and makes possible the insertion of any of the **FEDERAL** Radio Frequency Amplifying Transformers into the circuit, allowing radio frequency amplification at any wave length. Such parts as tube sockets, rheostats, jacks, grid condensers, grid leaks, are standard **FEDERAL** products.

They are especially well suited for use with the No. 8 and No. 9 Audio Frequency Amplifying Units. The combination of the No. 56 and No. 9 unit which constitutes one stage of R. F. Amplification with detector and two stages of A. F. Amplification is especially well suited for use with any type of receiving set using an antenna.

The combination of the No. 55 and No. 8 constituting two stages of R. F. amplification, detector and one stage A. F. amplification is particularly well suited for use with small outdoor antennas or indoor antennas. Where the user is forced by lack of space or other considerations to use the electric light wires or telephone wires, these two units will serve admirably to replace by their extraordinary degree of amplification what is lost by the insufficiency of antenna size.

The No. 55 and No. 56 units constituting three stages of R. F. amplification and detector are especially recommended for use with very small antennas or loop antenna where exceptionally long distance reception is to be done and where head telephones are used, while No. 55, No. 56 and No. 9, constituting three stages of R. F. Amplification, detector and two stages of A. F. amplification when used with a loop antenna serves to make possible reception over the greatest distances and allows the use of a loud speaker instead of a head set.

No. 56 One Stage R. F. Detector

The arrangement of terminals on these devices is such that when used together terminals that require connection are adjacent to one another, thus making proper connection most easily possible.

The No. 56 Unit is equipped with filament control, the jack allowing insertion of the head set directly to the detector circuit. This is valuable when this unit is followed by the No. 9 A. F. Amplifier.

Unless otherwise specified No. 35 R. F. Transformer is supplied with above units.

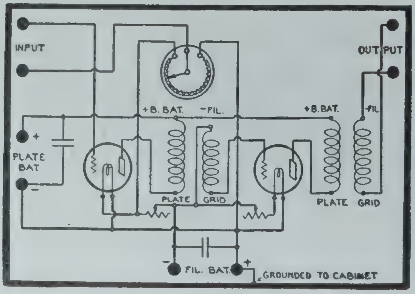
No. 55 TWO STAGE AMPLIFIER ....$58.00 Each

(Without tubes, batteries or telephones)

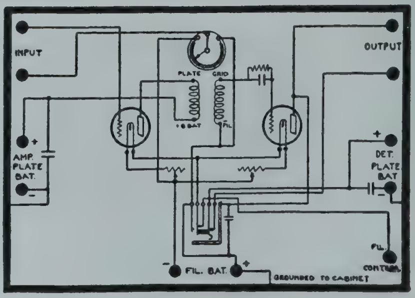
No. 56 ONE STAGE AMPLIFIER AND DETECTOR ....$52.00 Each

(Without tubes, batteries or telephones)

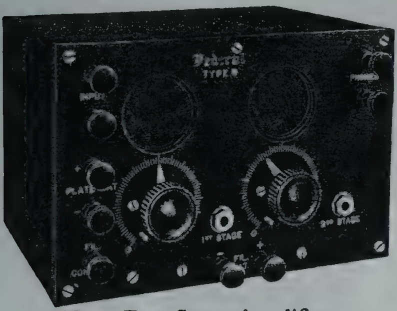
SCHEMATIC OF TWO-STAGE R.F. AMPLIFIER



SCHEMATIC OF #56 AMPLIFIER-DETECTOR UNIT



A. F. AMPLIFYING UNITS

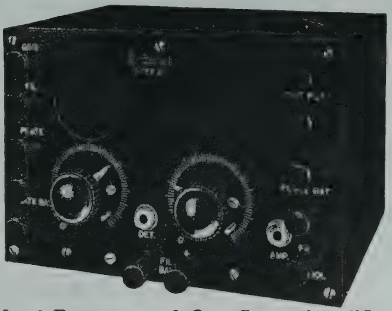


No. 9 Two Stage Amplifier

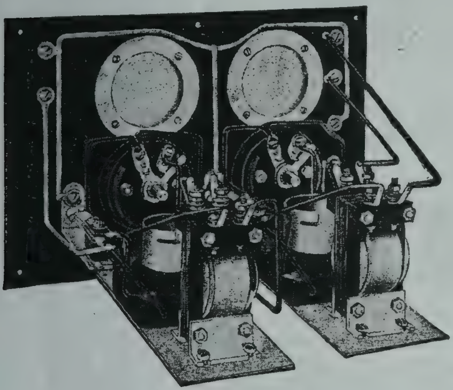
The **FEDERAL** Amplifier and Detector units make possible the most sensitive detector action and the greatest amplification without critical adjustment and without the possibility of "howling." The highly efficient and stable operation of these **FEDERAL** units is brought about by the use of the universally famous **FEDERAL** amplifying transformer; by their extremely careful construction and by the thorough electrical shielding between successive stages of amplification. The tube, transformer, tube socket, telephone jack and filament rheostat, constituting each stage of amplification, is enclosed in its own grounded metal housing and the parts of each stage and their interconnections so arranged that magnetic or electrostatic fields between successive stages, tending to produce "howling" and other objectionable noises, are entirely eliminated.

The **FEDERAL** Automatic Filament Control Jacks provide a convenient and rapid means for shifting the telephones from one stage to another. They are so connected that the insertion of the telephone plug in any stage lights only the filaments required by that stage of amplification.

All materials are carefully selected and each unit is thoroughly tested by experts before leaving the factory.



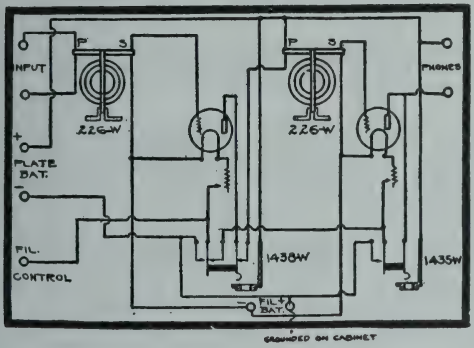
No. 8 Detector and One Stage Amplifier

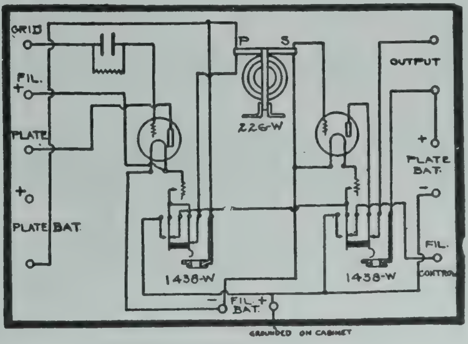


Interior No. 9

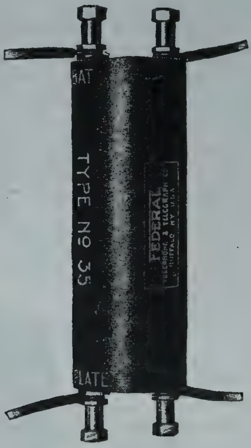
No. 8 Detector and One Stage Amplifier
(without tubes or batteries) ....$52.00 each

No. 9 Two Stage Amplifier
(without tubes or batteries) ....$58.00 each





R. F. AMPLIFYING TRANSFORMERS



Radio Frequency amplification, in addition to the high degree in which it is effective, is even more highly recommended than audio frequency amplification. It may be used to augment such amplification to a tremendous degree without effecting its stability.

These admirable characteristics of radio frequency amplification have been developed to the utmost in the **FEDERAL** Radio Frequency Amplifying Transformers. Through their use the overpowering advantages of this method of amplification may be fully employed with the greatest degree of simplicity and reliability that is possible with such a sensitive device as the radio frequency amplifier.

The **FEDERAL** Radio Frequency Transformers have been designed on the basis of very comprehensive research and, by actual measurement show a greater range of wave lengths over which they are capable of a higher degree of amplification than do any other similar devices. Their wavelength range ratings as given below are very conservative so that the user may be assured of maximum amplification over the specified ranges. It will be found possible to use these transformers at wavelengths in excess of those given by their rating but at some sacrifice in amplification.

To secure most satisfactory operation the UV-201 or UV-201-A vacuum tubes should be used.

It is recommended that not more than two stages be used in connection with receiving equipment using an antenna, since the amplification is so great that additional amplification is not proportionately effective because of the limitations imposed on any amplifying scheme by the presence of static. A small loop antenna may be made to serve the function of the antenna and it will be found possible to secure the same range of reception with such a loop and three stages of **FEDERAL** Radio Frequency Amplification as can be accomplished ordinarily with large outdoor antenna and less amplification.

These transformers are particularly effective in making it possible to accomplish reception with any of the many make-shift types of antennas, such as the small indoor antenna; using the electric light lines and telephone lines; etc.

The range of broadcast wavelengths covers from 222 to 545 meters. In order that the experimenter may construct a receiving set to cover this range the No. 35 R. F. Transformer has been developed. This transformer has a range of from 220 to 550 meters.

No. 29 R. F. Transformer—Wavelength 175- 300	$6.60	each
No. 35 R. F. Transformer—Wavelength 220- 550	6.60	each
No. 31 R. F. Transformer—Wavelength 500-1000	6.85	each
No. 32 R. F. Transformer—Wavelength 1000-3000	7.10	each
No. 40 R. F. Transformer Mounting only	.95	each

DIAGRAM SHOWING FEDERAL PARTS CONNECTED FOR 2 STAGES OF R.F. AMPLIFICATION - DETECTOR - & 2 STAGES OF A.F. AMPLIFICATION

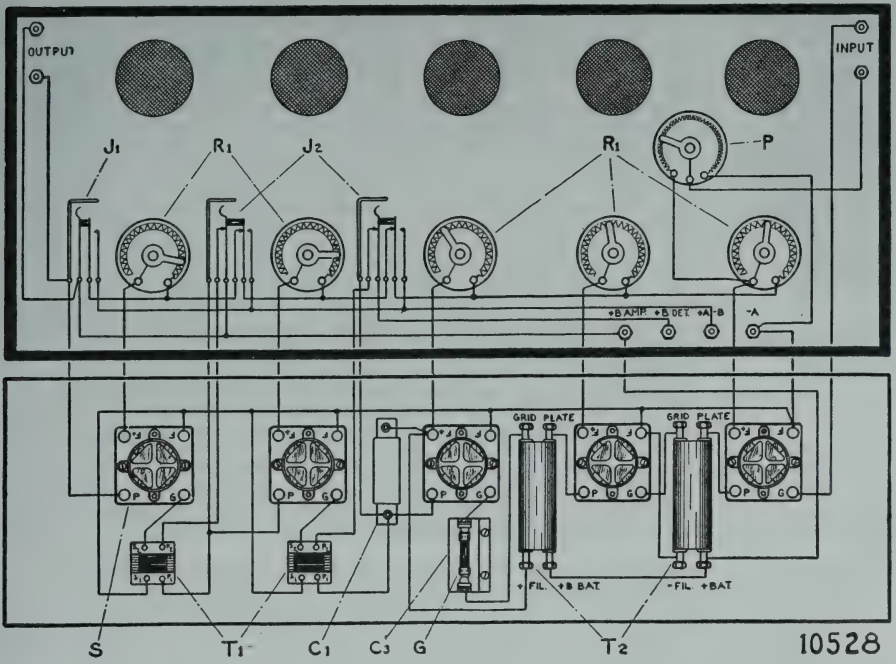
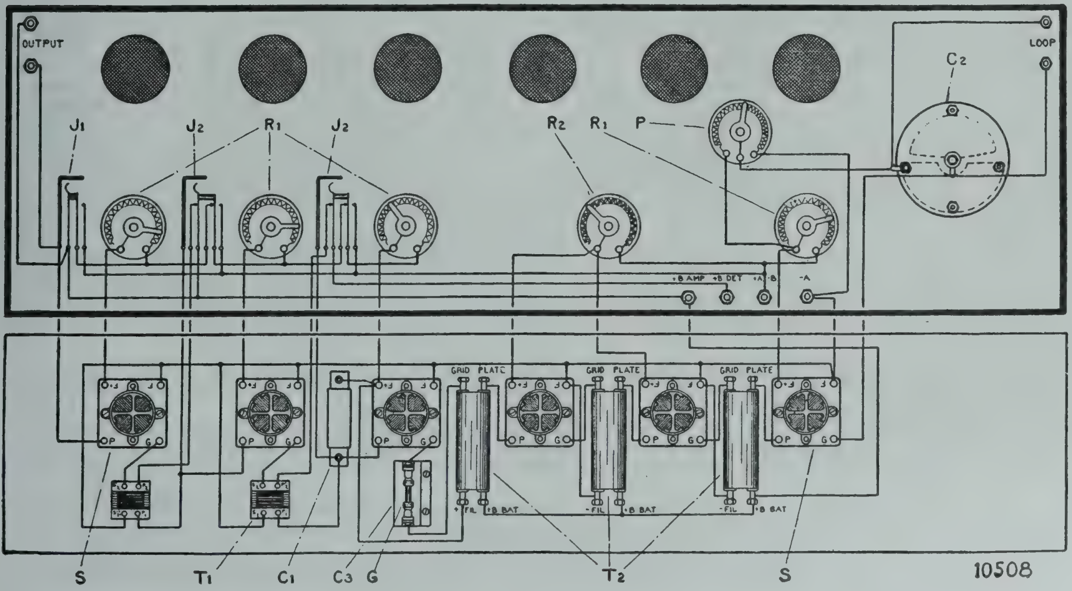


DIAGRAM SHOWING FEDERAL PARTS CONNECTED FOR 3 STAGES OF R.F. AMPLIFICATION DETECTOR - & 2 STAGES OF A.F AMPLIFICATION, ADAPTED FOR LOOP RECEPTION



No. 65 TRANSFORMER

The **FEDERAL** Research Division has during the last year made several interesting discoveries in its work on the theory of and means for the faithful reproduction of music.

While the work of the **FEDERAL** Research Division has for its aim the discovery of new principles upon which to base the design of new apparatus for radio reception, the solutions to the problems involved in the faithful reception of music are of such a fundamental nature and such broad significance that they explain much of the past failure of radio and sound recording, transmitting and reproducing apparatus to meet the high standards of the music lover, and they point the way past the many well nigh insurmountable difficulties that have confronted the designer of the equipment for these uses.

The most significant of discoveries lies in its analysis of what constitutes satisfactory music. This has required not only an investigation of what constitutes faithful music reproduction and how it may be secured, but a very careful investigation of the psychological effects of various types of music, the psychological effects of various musical instruments and a careful trial of the conclusions arrived at. Trials were first made to determine what parts of the music of a good orchestra could be omitted without serious loss of the pleasure of listening by the average observer. This was done through the manipulation of the broadcasting equipment of WGR. At certain performances the apparatus of the broadcasting station was deliberately manipulated that certain bands of tones were much reduced or increased while the remaining tones were kept at normal intensity. Then criticism of the transmission was asked and when given, carefully noted.

The results of successive trials have proven beyond a shadow of doubt that what the ear of the observer needs for complete satisfaction in the music is the presence of the lower tones of the orchestra. Its lack leaves a distinct feeling of dissatisfaction and insufficiency in the music while its presence gives a completeness and satisfaction that constitutes the difference between good music and what the radio listener has been forced in the past to accept.

The actual production of the means for securing the majesty and dignity of good music through the presence of the lower tones opens up a new and more serious problem than even the determination of what makes music reproduction satisfactory. There seems almost to be a conspiracy on the part of nature to make this difficult, if not impossible. In transmission of music by radio this is easily evident. The more usual forms of voice converting equipment such as the ordinary microphone invariably neglect the lower tones, and while the very high tones may not be emphasized, they are consequently reproduced with a relatively greater intensity than are the very low tones, and the beauty of the music is lost in the very first link between the sound and the ear of the observer. The same loss of the lower tones follows in each step of amplification between the microphone and the transmitting antenna, with the exception perhaps, that in the transfer of the music carrying radio wave, into the transmitting antenna no loss of the low tones may occur.

In the reception of the music-ladened radio wave the same loss of the lower tones and the over emphasis of the higher tones occurs again. Here again the amplifiers neglect the bass and emphasize the upper register and here, perhaps, lies the greatest cause for dissatisfation with the radio music.

While the problem of the loss of the lower tone is as serious in the transmitting equipment as in the receiving equipment, the fact that one transmitter serves many thousands of listeners has justified the great invesment necessary for the construction of special faithfully reproducing microphone and voice amplifying equipment. But the problem of designing equally good equipment for the radio listener has been attended by the same difficulties and with the added limitation that comes with the fact that the selling price of such equipment must be such that it is well within the reach of the radio listener.

In addition to the need for the more faithful reproduction of the low tones, careful measurement has shown that the ordinary amplifying equipment fails in that it adds tones that are not present in the music and amplifies these self-made tones. Fortunately for the radio listener these added tones are usually of such a nature that they are not unharmonious but they do, of course, materially change the nature of music. These are, in the main, harmonics of the note being amplified and are, therefore, notes of frequencies which are multiples of the frequency of the original note. Unless, of course, harmonic notes higher than the 7th harmonic are produced, the combination of the note plus its harmonic will not be unpleasant, but the combination will again be preponderantly higher in tone than was the original note and will, therefore, add further to the predominance of the high notes.

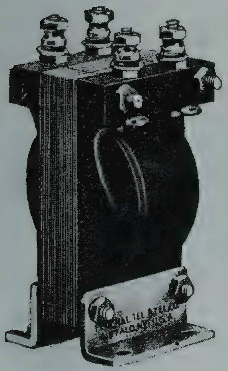
The methods for the elimination of these many difficulties lie through the careful design of the amplifying transformer. The matter is one that requires the greatest possible care in choice of proportions, natures of the materials involved, and their more careful fabrication and assembly.

The No. 65 **FEDERAL** Transformer has been designed to eliminate the objections that have so limited the beauty and faithfulness of reproduction in the past. Its design and construction is of such a nature that the notes of the bass viol, the kettle drum, the piano bass are carried through the system with a completeness and roundness that is amazing.

It is of such construction that each note that enters it is passed on to the vacuum tube with exactly the same roundness and without a suggestion of any added tones, whether dissonant or not. And, when used with
UV-201 UV-201-A WD-12 UV-199
or any of the other commonly available tubes the degree of exceptionally satisfactory amplification exceeds that which has yet been available with any A. F. Transformer.

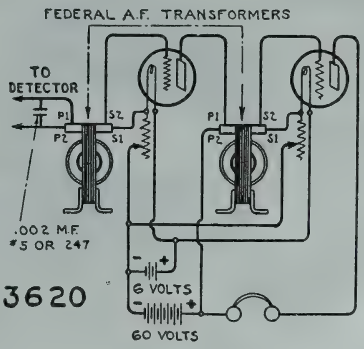
No. 65 A. F. Transformer ....$7.00 Each

AUDIO FREQUENCY TRANSFORMERS



No. 226 Transformer has been pronounced by the leading Radio engineers after exhaustive and most rigid tests, to excel in all essentials.

The transformer itself consists essentially of a core of especially chosen silicon steel sheet, with a carefully built winding assembled integrally with the core and supplied with conveniently located terminal screws.



It has a comparatively low ratio of transformation, approximately 3 to 1, and is so designed that it serves admirably for use with any of the vacuum tubes in common use. The flux leakage is kept at a minimum, consequently the tendency to oscillate at audio frequencies due to stray fields between the circuits is reduced to a minimum.

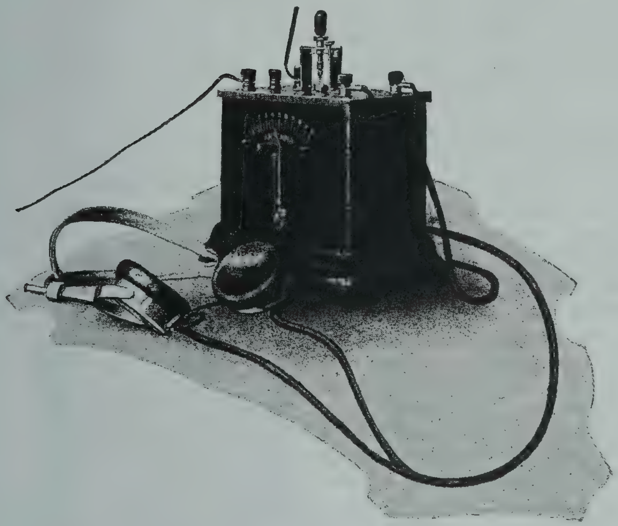
Within the past two years the superiority of the No. 226 Transformer for voice and music amplification has been demonstrated. It makes possible the vacuum tube amplifier that will reproduce the music as loudly and with the same purity as the original.

Recent tests indicate that the connections of the No. 226 Transformer should be as follows to obtain the best results:

P-1 to plate;	S-1 to filament;
P-2 to B. Battery	S-2 to grid.

No. 226 .... $5.50 Each

FEDERAL JR. BROADCAST RECEIVING SET

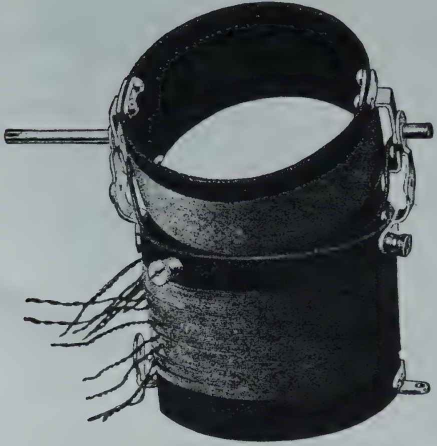


The **FEDERAL JR.** is, in itself, a complete receiving set requiring nothing more than the aerial wires for its operation. It is most ruggedly constructed, beautiful in appearance, simple in its operation and absolutely reliable. No batteries are required for its operation, nor are replacements of any kind ever required.

The Receiver when used with the proper antenna, is capable of receiving signals from radio telephone broadcasting and amateur stations within a range of 15 to 30 miles and of receiving ship and shore radio stations within a range of 100 to 500 miles, depending upon the height of the antenna and the power of the transmitting station.

The entire unit is mounted on a black laminated phenol panel which fits the metal case. The detector is of utmost ruggedness and reliability, designed to allow a wide variety of adjustments The head telephones are the standard **FEDERAL** phones that were in such general use in the Naval Service throughout the recent war. Full instructions accompany each set.

FEDERAL JR. Complete ....$20.00 Each

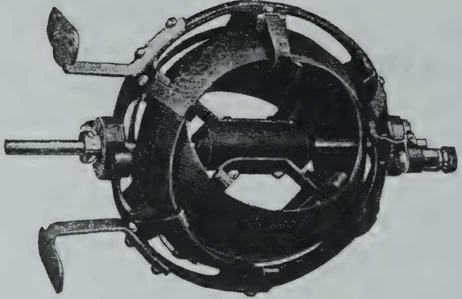


No. 95 VARIOCOUPLER

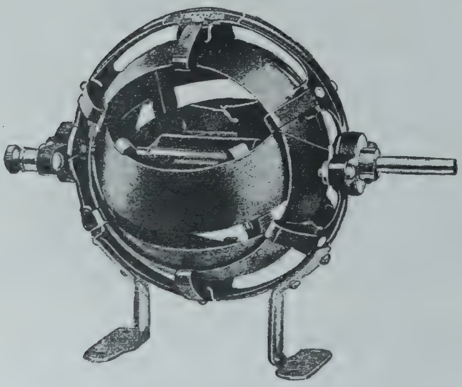
The **FEDERAL** No. 95 Variocoupler comprises a primary and a secondary winding, the secondary being placed in such a position with respect to the primary winding that its coupling with the latter is variable through a wide range. This relation allows extreme fineness of tuning, an essential condition in present-day tuners.

The primary winding of the No. 95 Variocoupler is adjusted to such a value that it will respond to signals throughout the broadcast wave length band when used with an average receiving antenna. Taps are provided in such a manner that an adjustment may be made to a single turn of winding throughout the range. The secondary is a winding fixed at such a value that when used with a No. 45 **FEDERAL** Variable Air Condenser (maximum capacity .000250 mf.) it will tune to signals throughout the broadcast wave length band.

No. 95 Variocoupler	**$7.00 each**



Arranged for Panel Mounting



Arranged for Table Mounting

No. 90 VARIOMETER

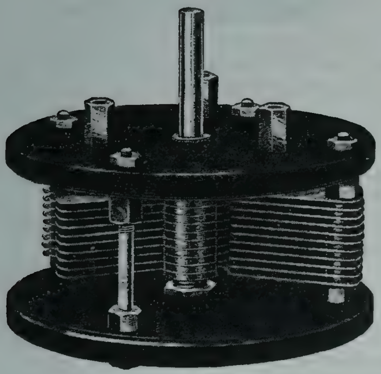
The **FEDERAL** No. 90 Variometer is a variable inductance unit which finds extensive use in vacuum tube receiving circuits. It comprises two spherical shaped inter-connecting windings, the inner winding being rotatable with respect to the outer winding. The coils are so connected that a wide range of inductance is obtained as the movable element is rotated.

The windings are supported by six small but sturdy bakelite supports, thus reducing to a negligible amount the electrical losses due to insulation material in proximity to the coils. Notwithstanding the few supports, the device is extremely rugged and is therefore adaptable to any type of receiver. Connections of the rotating coil are secured through heavy friction contactors, assuring positive electrical connection. By a slight change the instrument may be mounted on panel or table.

The No. 90 Variometer is the result of considerable study into the electrical properties of such devices and represents the utmost efficiency. The distributive capacity of the windings never exceeds .000016 mf. and hence is desirably low. The average capacity throughout the settings is .000014 mf. The constants are approximately as follows: inductance maximum 1150 micro-henrys: minimum 150 micro-henrys; ratio 7.7.

No. 90 Variometer	**$8.00 each**

VARIABLE CONDENSERS



The **FEDERAL variable condenser** is a device which has a maximum of capacity for a given space, together with a minimum loss at radio frequencies. The movable plates of the condenser are kept in perfect alignment by a two bearing arrangement and held in constant relation to the fixed plates by precision manufacture and assembly. End supports are of bakelite and the design provides greatest length of insulating material between supporting standards. Provision is made so that the condenser may be panel mounted. Connections to the condenser are made either through a screw or by soldering.

Because of its excellent and accurate construction, this condenser affords a greater capacity in a smaller space than is usually found; the capacity per dielectric averaging 27.5 micro-microfarads.

Due to the low minimum capacity of all types of **FEDERAL** Variable Condensers a wide variation in wave length range may be expected. The **FEDERAL** No. 44 (7 plate), No. 45 (11 plate), and No. 46 (21 plate), have minimum capacity never exceeding 10 mmf. The minimum capacity of the No. 47 (43 plate) condenser is always less than 15 mmf.

Condensers are furnished without Knob and Dial, Diameter of shaft—¼ inch.

No. 44— 7 Plate. Cap. approx. 190 mmf. (.00019 m.f.)	**$3.30 each**
No. 45—11 Plate. Cap. approx. 275 mmf. (.00027 m.f.)	**3.40 each**
No. 46—21 Plate. Cap. approx. 550 mmf. (.00055 m.f.)	**3.85 each**
No. 47—43 Plate. Cap. approx. 1100 mmf. (.00110 m.f.)	**5.15 each**

ENCLOSED TYPE VARIABLE CONDENSER

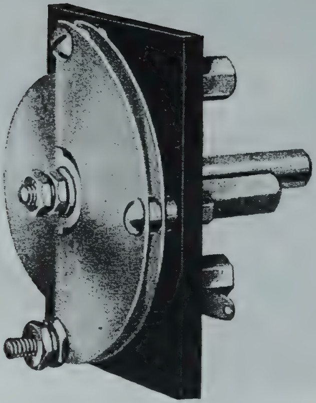
To the experimenter who desires a Variable Condenser which may be quickly and easily moved from one circuit to another, we recommened the **FEDERAL** Enclosed Type.

It is composed of the **FEDERAL** standard panel type Variable Condenser enclosed in a brass case finished in black enamel. The Condenser is suspended from the bakelite plate which forms the top of the case, thus allowing its removal from the case when desired. The case itself is securely spot welded.

The bottom of the case is provided with a flange suitably notched to accommodate mounting screws if it is desired to fasten the Condenser to the table.

No. 81— 7 Plate	**$6.40 each**
No. 82—11 Plate	**6.55 each**
No. 83—21 Plate	**7.10 each**
No. 85—43 Plate	**8.65 each**

VERNIER CONDENSER



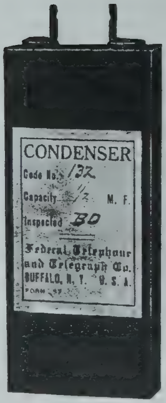
FEDERAL No. 48 Vernier Condenser is designed for use with any circuit where a vernier wavelength adjustment is necessary. When connected in parallel with any type of **FEDERAL** or other variable air condenser it will allow very careful tuning. It is a complete unit within itself and may be added to a complete set without making any changes in the layout except that of the addition of the Vernier condenser.

It is, therefore, quite independent in its operation of the main condenser and if kept set at the middle of its range while the main condenser is being adjusted, it will serve to give an extraordinarily precise degree of tuning without the extreme care in adjustment required to get even a moderate degree of precision of adjustment of the main condenser.

Its location as part of the receiver is quite independent of the main tuning condenser thus making it possible to locate the Vernier most conveniently and symmetrically with respect to the other controls of the receiver.

No. 48 Vernier Condenser	$1.90 each

RADIO FREQUENCY BY-PASS CONDENSERS

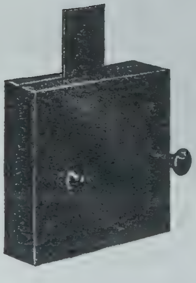


In using multi-stage radio frequency amplifiers, a large loss may be expected if precautions are not taken to confine the radio frequency to the proper path. This can only be accomplished by the use of condensers of sufficiently large capacity. Such condensers should be built into the amplifier itself and connected across the lead-in wires from the A battery, the B battery, and in addition to this, across the stabilizer. These condensers can be used in circuits employing up to 400 volts.

The following condensers serve this purpose admirably:

No. 130— .1 mf	$ .50 each
No. 131—.05 mf	.50 each
No. 132— .5 mf	.75 each
No. 133—1.0 mf	1.00 each
No. 134—1.5 mf	1.25 each

MICA TYPE CONDENSER

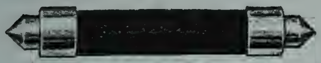


The Mica Type Radio Frequency By-Pass Condenser meets the demand for a highly efficient, low loss condenser. It is also ideal for use as a grid condenser. The unit is made up of copper plates, insulated with mica. The entire condenser is secured between metal plates to insure permanency of capacity.

Connection is made to the metal plate on one side and a copper strip for the other. Two screws are furnished for convenience in mounting.

No. 242 .000125 mf	$1.00 each
No. 243 .000250 mf	1.00 each
No. 244 .001 mf	1.10 each
No. 247 .002 mf	1.20 each

GRID CONDENSER AND GRID LEAK MOUNTING

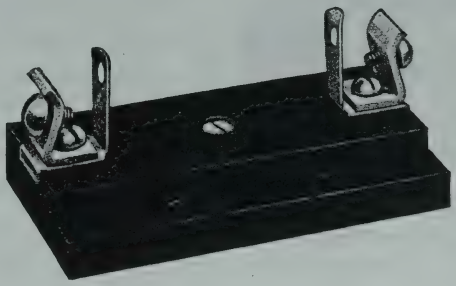


The **FEDERAL** Grid Leak is made in nine standard resistances, and is so designed as to be adjustable between wide limits.

The resistance unit is carried inside a shell of insulating material between two metal terminal members, so proportioned as to fit our No. 120 Grid Condenser and Mounting. The highest grade of insulating material is used and the terminal ends are of brass with highly polished nickel finish.

When assembled, the resistance unit is hermetically sealed and its resistance is not changed by temperature or moisture. It may be disassembled and a change made in its resistance value in the space of a very short time, and through its use, make possible the choice of grid resistance to exactly suit any receiving equipment or vacuum tube.

No. 121— ½	meg	**$ .75 each**
No. 122—1	meg	**.75 each**
No. 123—1½	meg	**.75 each**
No. 124—2	meg	**.75 each**
No. 125—2½	meg	**.75 each**
No. 126—3	meg	**.75 each**
No. 127—3½	meg	**.75 each**
No. 128—4	meg	**.75 each**
No. 129—5	meg	**.75 each**



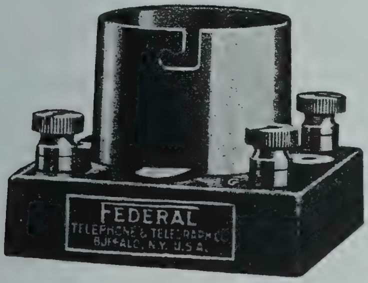
The **FEDERAL** No. 120 Grid Condenser and Mounting was designed to meet the demand for a sturdy and reliable grid control unit.

The Condenser is composed of copper plates, using mica as the dielectric. The whole unit is securely clamped between hard rubber plates to insure permanency of capacity.

The top clamping plate carries receptacles which are suited to all standard types of grid leaks, but were especially designed to accommodate the **FEDERAL** grid leak cartridge. The hard rubber parts are highly polished and all metal parts brightly nickeled, making a pleasing addition to any radio apparatus.

No. 119—Mounting only	**$ .50 each**
No. 120—With Condenser in Base	**.75 each**

VACUUM TUBE SOCKETS

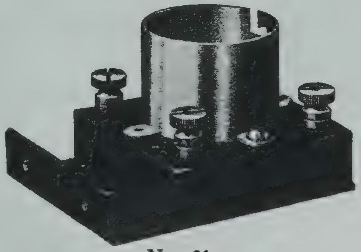


No. 16

The **FEDERAL** Vacuum Tube Socket designed for use with receiving or transmitting tubes, is remarkably rugged and sturdily built.

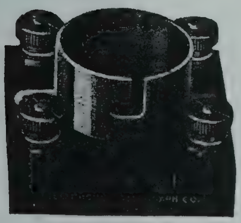
The base being of bakelite, the barrel nickeled and highly finished, the binding posts conveniently and carefully designated, make a unit of pleasing construction and individuality.

By a unique arrangement, the contact springs are so placed as to eliminate the possibility of their being caught or twisted by the prongs of the tube, when the tube is inserted.



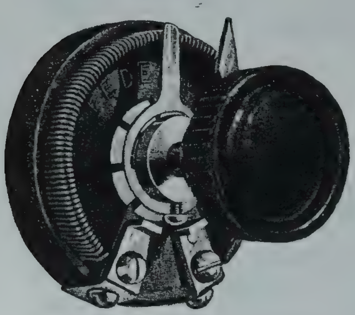
No. 21

No. 16 V. T. Socket	**$1.00 each**
No. 21 Panel Mounting Socket	**$1.20 each**



The **FEDERAL** No. 14 Vacuum tube socket is of the same design and construction as the Nos. 16 and 21 with the exception that it was designed for use with the UV-199 Tube.

No. 14 V. T. Socket	**$1.00 each**



Arranged for Table Mounting

FILAMENT RHEOSTATS

FEDERAL Filament Rheostats combine simplicity of design, high quality of material and careful machining and assembly of parts. They are equipped with large knobs providing ease of adjustment, and through a slight change may be quickly mounted on panel or table.

The rheostats are composed of two parts; the knob and shaft, and the base which incorporates the resistance unit and contact arm. Two set screws are provided in the contact arm to hold the shaft firmly thus eliminating any possibility of slipping. The shaft is moulded into the knob and no set screw is necessary.

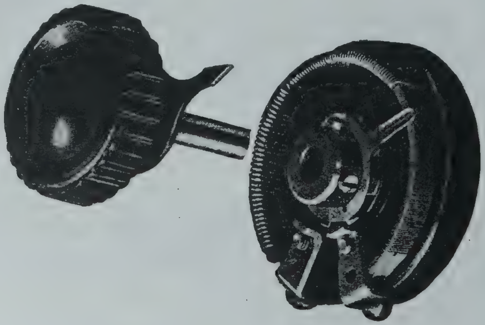
In building your radio receiver choose the rheostat that is best suited to the type and number of tubes and the type of battery you propose to use. The data below will tell you which rheostat to use.

Number of Tubes	Type of Tube	Type of Battery	Type of Rheostat
1	UV-201	3 Cell Storage Battery	No. 18, No. 19, No. 23 or 27
1	UV-200	3 Cell Storage Battery	No. 18, No. 19, No. 23 or 27
2	UV-201	3 Cell Storage Battery	No. 19, No. 23 or 27
1 or more	UV-201-A	3 Cell Storage Battery	No. 22, No. 23 or 27
1 or more	WD-11	1 Cell Storage Battery or 1 Cell Dry Battery	No. 22, No. 23 or 27
1	UV-199	3 Cell Dry Battery	No. 26 or 27
2 or more	UV-199	3 Cell Dry Battery	No. 22, No. 23 or 27
2 or more	UV-199	3 Cell Storage Battery	No. 27

The No. 23 Rheostat has two windings; one being of heavy wire and the other of fine wire. As the rheostat is turned on the current carrying capacity of both sections is .75 amperes, resistance 16 ohms. The second section 1.8 amperes, resistance 2.2 ohms.

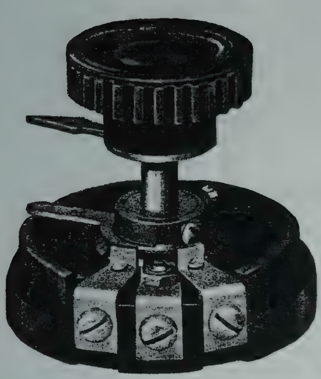
The No. 27 Rheostat is similar to the No. 23 except that it has three windings and will control any type of tube with any type of battery up to 6 volts. As the rheostat is turned with all three sections in the current carrying capacity is .25 amperes, resistance 60 ohms. With two sections in 1. amperes, resistance 5.5 ohms. The last section, 2. amperes, resistance 1.5 ohms.

Type	Resistance	Current Capacity	Each
No. 18	5.5 ohms	1. Ampere	$1.10
No. 19	1.5 ohms	2. Amperes	1.10
No. 22	25. ohms	0.75 Amperes	1.50
No. 23	16. ohms	see above	1.70
No. 26	60. ohms	0.45 Amperes	1.60
No. 27	60. ohms	see above	1.90



Showing Two Piece Construction

POTENTIOMETERS



A high-resistance potentiometer finds extensive use in the up-to-date experimenter's station. Such a potentiometer is most valuable as a stabilizer in a receiving set using several stages of radio frequency amplification. The potentiometer also finds use in circuits employing gas content detector tubes, where close variation of the plate voltage is necessary; the potentiometer accomplishes this by very gradually adding to or subtracting from the "B" battery the voltage of the "A" battery.

The total resistance of the No. 24 potentiometer is 200 ohms. The current taken by the device is approximately 30 milliamperes, which is a negligible load on the average "A" battery.

The No. 25 Potentiometer is an especially high resistance potentiometer and will be found to be very well suited to such circuit arrangements in which a very high resistance is required.

In general construction details it resembles the No. 24 Potentiometer, being built up of the same high grade moulded phenolic base and knob, and is supplied with the same easy moving and positive contacting control arm. It is provided with three terminals conveniently located, and a reversible knob and shaft so that the whole unit may either be panel or table mounted with perfect accessibility to the terminals and to the knob.

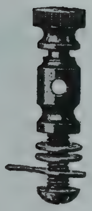
It has resistance of approximately 1850 ohms and because of its resistance will be found especially well suited for use with any dry battery type of tube, where the current taken by the more commonly available low resistance potentiometer is found to be objectionably large. When so used, the current from the dry batteries taken by the potentiometer will be found to be extremely small and to have no appreciable effect on the life of the dry batteries supplying the filament.

Because of the extremely fine wire used in the potentiometer the control which it provides in actual use will be found to be exceedingly gradual and will make it preferable, even under conditions where the lower resistance potentiometer could be used.

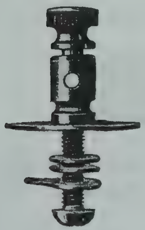
It is most highly recommended for all circuit arrangements requiring a potentiometer, and especially recommended for use in conjunction with dry cell tubes.

No. 24—Potentiometer— 200 Ohms	$1.50 each
No. 25—Potentiometer—1850 Ohms	2.20 each

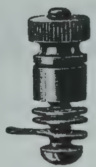
BINDING POSTS AND CONTACT STUDS
(Nickel Plated)



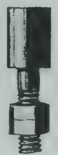
Binding Post
No. 97-022
$ .15 each



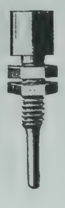
Binding Post
No. 97-023
$ .20 each



Binding Post
No. 97-024
$ .15 each



Switch Stop
No. 330-201
$ .04 each



Switch Contact
No. 330-200
$ .04 each

KNOB AND DIAL

The **FEDERAL** Knob and dial makes possible the connection between any type of rotating apparatus and the hand of the operator through a device of unquestioned mechanical and electrical perfection. Its beauty of line and finish is quite unrivalled and the ease of operation and precision of setting which results from its use is startlingly greater than is normally expected from so simple a device. The ease with which it may be assembled on any device makes it invaluable to the builder of his own apparatus and its almost unique effectiveness makes it essential to secure the maximum efficiency from any device requiring rotary control.

The several **FEDERAL** Dials are constituted of the finest grade of black phenolic condensation material, of extraordinary strength and remarkably rich polished finish. The dials carry engraved scales of a sharply contrasting white.

The No. 7 knob and dial incorporates an exceptionally large knob so that the usual vernier control is made quite unnecessary. The knob is so shaped as to fit the hand of the operator most conveniently and may be operated continuously with no fatigue to the operator, while the scale is so placed that it is quite exposed even while the knob is in the hand of the operator.

Provision is made for the use of a number of different shaft sizes so that by a minor adjustment of the fastening member it may be used for shafts of any external diameter between $\frac{3}{16}$ and ¼ inch in diameter.

These dials are provided with a stop groove on the underside, whereby a simple stop pin mounted in the panel beneath the knob provides a stop to limit the rotation of the knob to 180° thereby relieving the shaft of the strain resulting from any attempt at rotation beyond its proper limits.

The No. 7 knob is 4″ in diameter and carries 180° scale divided into 100 parts. It is especially suited for use on tuning condensers, variometers, etc., and wherever ease of operation and great precision of setting are required.

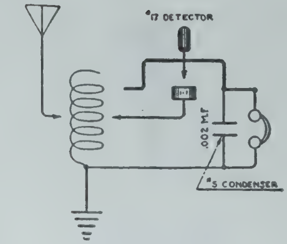
The No. 3 dial is especially suited for use on variocouplers, and similar devices where the possible precision of setting of the No. 7 dial is not necessary or where the limitations of space make a small dial essential. It is 3 inches in diameter and carries a 180° scale divided into 100 parts.

The No. 12 dial is very well suited to use in connection with Vernier controls of all kinds. Its smaller diameter makes it useful where the larger diameter knobs would require more than the allowable panel space and the shape of its knob makes possible its constant operation with only a minimum of fatigue and a maximum of precision of setting for so small a knob. It is 2 inches in diameter and carries a 90° scale which is divided into 20 parts.

The No. 2 dial is two inches in diameter and has a 180° scale divided into 100 parts. It is designed especially for use with vernier condensers. It may be used in any place where a small dial is required.

No. 7 (4 inch) Knob and Dial—180° scale	**$1.50 each**
No. 3 (3 inch) Knob and Dial—180° scale	**.65 each**
No. 12 (2 inch) Knob and Dial— 90° scale	**.40 each**
No. 2 (2 inch) Knob and Dial—180° scale	**.45 each**

HEAD TELEPHONE SHUNTING CONDENSER

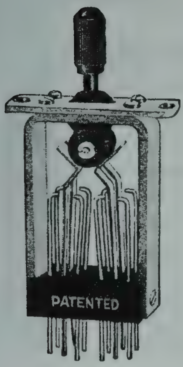


The **FEDERAL** No. 5 Fixed Condenser is used to shunt across the terminals of the Head Telephones. Very compact and of excellent construction. Capacity .002 mfd.

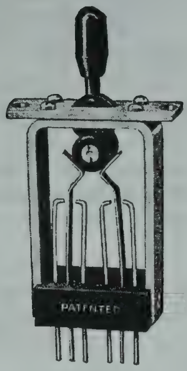
No. 5 Fixed Condenser	**$ .35 each**

ANTI-CAPACITY SWITCHES

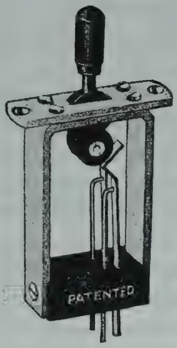
(Patented)



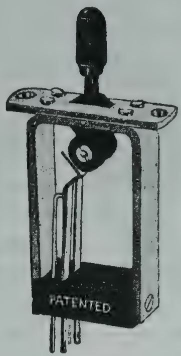
No. 1424-W



No. 1425-W



No. 1426-W



No. 1427-W

The original Anti-Capacity Switch which has supplanted the old flat spring type with its high capacity which is detrimental in radio circuits. These switches may be used to quickly change from one stage to another; to switch from a long wave set to a short wave set and numerous other uses which the ingenious experimenter may devise.

All Anti-Capacity Keys are equipped with highly nickel plated face plates. Springs are of phosphor bronze silver plated for good conductivity. The insulating block in which the springs are mounted, is phenol plate—the best insulating material known. The Cam arrangement is of the roller type providing smooth and easy lever action.

No. 1424-W, 1425-W and 1427-W are normally open. No. 1426-W is normally closed.

No. 1424-W.	**FEDERAL** Anti-Capacity Switch.	4 P.D.T.	12 spring	......**$3.35 each**
No. 1425-W.	**FEDERAL** Anti-Capacity Switch.	D.P.D.T.	6 spring	...... **3.30 each**
No. 1426-W.	**FEDERAL** Anti-Capacity Switch.	D.P.S.T.	4 spring	...... **3.05 each**
No. 1427-W.	**FEDERAL** Anti-Capacity Switch.	D.P.S.T.	4 spring	...... **3.20 each**

PANEL LEVER SWITCHES

Rotary Lever Switch

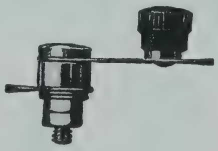
A very excellent switch. Moulded knob handle with switch bolt moulded in. Nickel plated brass bushing. Nickel silver switch lever. Arranged to mount on 1/8", 3/16" or 1/4" panel.

No. 97-020 ....**$ .60 each**

Miniature Lever Switch

A small lever switch of good design. Parts nickel plated. Provided with bushing, solder clip—two washers and nuts. For mounting on panel up to 1/4".

No. 97-021 ....**$ .40 each**

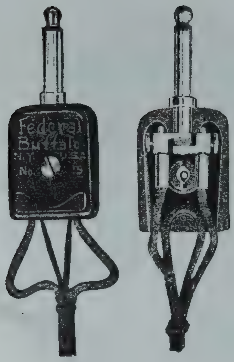


97-025 SWITCH

A well built switch which may be mounted on panels up to 5/16 of an inch thick. The triple spring contact lever assures positive contact with the switch point. All parts are nickeled. The same switch as is used on all **FEDERAL** Receiving Sets.

No. 97-025 ....**$1.60 each**

RADIO PLUGS



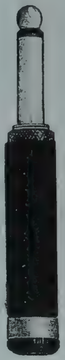
No. 15 Universal Plug is a radical departure from the ordinary telephone plug. Unlike others of similar design, spade terminals, pin connections, stranded or solid wire may be used without soldering.

Consists of only five simple parts—two highly finished bakelite moulded pieces, the plug with its connecting screws and a brass screw and collar for holding the two together. The connecting screw does not come in contact with electrical circuit in any way.

The plug may be used for inserting head telephones, power supply, microphone transmitters, transmitting keys and for as many other purposes as the ingenuity of the radio operator may dictate.

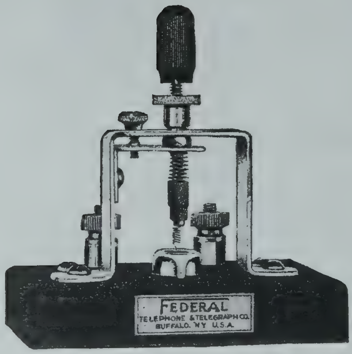
No. 15	$ .80 each

No. 1428-W Plug is a two-circuit plug, very substantially made, and will stand a breakdown test of 500 volts. Rubber bushing on cord end prevents short circuiting of the telephone cord on the plug through excessive wear.


No. 1428-W

No. 1428-W—Plain brass	$2.00 each
No. 1428-W—Silver plated	2.50 each

CRYSTAL DETECTOR



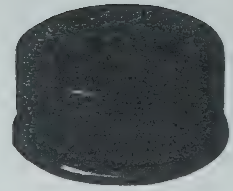
The **FEDERAL CRYSTAL DETECTOR** is designed to meet the need for a simple, cheap and reliable detector. It will be found to have exceptional sensitivity, extreme ruggedness, complete accessibility of parts and extraordinary ease and permanency of adjustment.

For the reception of radio telephone signals, it will be found unique in the intensity of signals that may be obtained by means of its use, and when used in connection with a vacuum tube amplifier, it will be found unrivalled in the intensity of the resulting signals and the quietness of operation of the system.

It is built of the highest grade of materials. All parts are made adjustable and all parts and adjustments are completely exposed, so that any change in adjustment may be quickly and easily made.

No. 17 Detector	each, $2.70
No. 17-A Extra Crystals	each, .50

HIGH FREQUENCY BUZZERS
(Century)



An exceptionally well designed high frequency buzzer for wave meter, test set or laboratory use.

Contact points are of pure platinum. Adjustment is obtained by means of two screws.

No. 168 Buzzer	each, $2.50
Armature only	each, 1.00

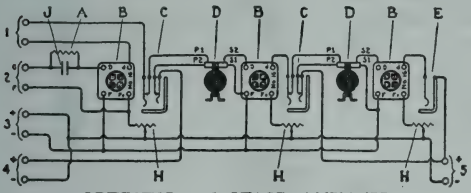
RADIO JACKS

No. 1421-W

No. 1422-W

No. 1423-W

The all around efficiency and reliable construction of **FEDERAL** Radio Jacks have caused them to be adopted as standard equipment in all types of radio apparatus. The frame is of nickeled brass, one-half inch wide. three fourths of an inch high; overall length three and one-half inches. The springs are made of highly tempered nickel silver. Pure silver contact points are used, thereby assuring the best possible electrical contact. The insulation is of phenol plate, known under such trade names as Formica, Bakelite or Redmanol.



DETECTOR & 2 STAGE AMPLIFIER

NOTE
1 = TICKLER OR VARIOMETER CONNECTION
2 = TO SECONDARY
3 = TO FIL BAT 6 VOLTS
4 = TO DET PLATE BAT. 16-22½ VOLTS
5 = TO AMP PLATE BAT. 40-60 VOLTS
A = #122 GRID LEAK
B = #16 SOCKET
C = 1423-W DOUBLE CIRCUIT JACK
D = 226-W TRANSFORMER
E = 1421-W SINGLE CIRCUIT JACK
H = #18 RHEOSTAT
J = #120 GRID COND.

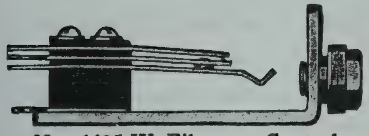
Each Jack is supplied with three washers which allows its use with panels of different thickness, viz: One eighth inch; three-sixteenths inch, and one-fourth inch.

All **FEDERAL** Radio Jacks are designed for use with Nos. 15 and 1428-W Plugs.

No. 1421-W—Open Circuit	each	$ .60
No. 1422-W—Closed Circuit	each	.70
No. 1423-W—Double Circuit	each	.80
No. 1435-W—Filament Control	each	.85
No. 1438-W—Filament Control	each	1 00

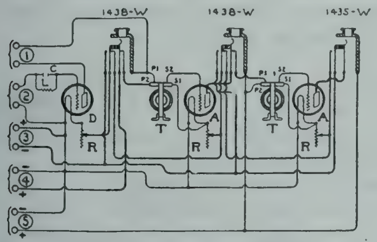
AUTOMATIC FILAMENT CONTROL JACK AND CIRCUITS

(Patent applied for)


No. 1435-W Filament Control

No. 1438-W Filament Control

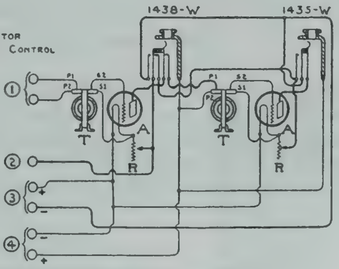
The **FEDERAL** automatic filament control jacks provide a convenient and rapid means for shifting the telephones from one stage to another. They are so connected as to cause the insertion of the telephone plug in any stage to light only those filaments required by that stage of amplification. Removal of the telephone plug immediately extinguishes all filaments and allows their relighting by the mere insertion of the telephone plug without adjustment of the filament rheostats.



DETECTOR & 2 STAGE AMPLIFIER USING FILAMENT CONTROL JACKS

NOTE
1 — To Tickler Coil
2 — To Secondary
3 — To "A" Bat 6 Volts
4 — To "B" Bat 18 to 30 Volts
5 — To "B" Bat 40 to 60 Volts
C — #120 Grid Condenser
D — Detector Tube
L — #122 Grid Leak
A — Amplifier Tubes
R — #18 Rheostat
T { 226-W or #65 Transformer

NOTE
1 — To Phone Connection, Detector
2 — To Detector Jack, Filament Control
3 — To A Bat 6 Volts
4 — To B Bat 40 to 60 Volts
A — Amplifier Tubes
R — Rheostat #18
T — 226-W or #65 Transformer



2 STAGE AMPLIFIER USING FILAMENT CONTROL JACKS

HEAD TELEPHONES

The sensitiveness and durable efficiency of the **FEDERAL** Head Telephone is peculiar to the **FEDERAL** Head Telephone alone. Twelve years of manufacturing Head Telephones, together with constant experimenting in order that they might attain a still higher degree of efficiency enables us to offer the **FEDERAL** Head Telephone which stands so high in the favor of all Radio enthusiasts.

SPECIFICATIONS

Weight—The total weight of the Nos. 52-W and 53-W Head Telephones, complete with head band and cord is only 14 ounces. This unusually light weight is one of the factors which make these instruments so comfortable when worn for long periods of time.

Head-Band—This feature is of the standard Navy type, light in weight and comfortable. May be readily bent to conform to the contour of the user's head. Raising and lowering of the receivers on the band is easily accomplished. The large ear caps and light weight aluminum receiver cups promote wearing comfort.

Cord—Full length, six feet. Covered with long-wearing mercerized cotton braid. Strain loops at ends remove wear from conductors and prevent open circuits.

Coils—Correct design of cores makes possible, maximum "ampere-turns" so situated on the cores to produce maximum effect on diaphragms. Each coil is individually tested on a resistance measuring instrument. Inspection makes impossible such defects as short-circuited turns, "grounds", "opens" and insufficient turns. The tolerated variation of resistance of No. 53-W Head Telephones is less than 2%, and of the No. 52-W, less than 3%. High grade enameled copper wire wound by skilled operators and checked by careful inspection assures permanent satisfactory results.

Magnets—Only highest grade tungsten steel is used for magnets. **FEDERAL** magnet hardening methods assure the user of a lifetime of normal use without the loss of magnetism. The nature of the steel and processes result in maximum retentivity and permeability. **FEDERAL** head sets are equipped with double permanent magnets which feature promotes almost unlimited life with uniformity of operation. Two magnetic tests take place; the first, before assembly and after ageing; the second, after assembly has been completed.

Diaphragms—Because of the peculiar clearness of tone produced by ferrotype steel diaphragms, **FEDERAL** has standardized on this material for Head Telephones. Each diaphragm is carefully micrometered for thickness. The clearances between diaphragm and magnet pole faces are scrupulously maintained by a process whereby the pole faces are ground after assembly. A careful inspection process requires each receiver to meet a rigid standard of precision. The two receivers in a double head set are adjusted to agree in tone quality.

No. 52-W	Double	3200 Ohms	each	$9.00
No. 53-W	Double	2200 Ohms	each	7.00
No. 51-W	Single	75 Ohms	each	4.20
No. 54-W	Single	1600 Ohms	each	6.00
No. 50-W	Single	1100 Ohms	each	4.90

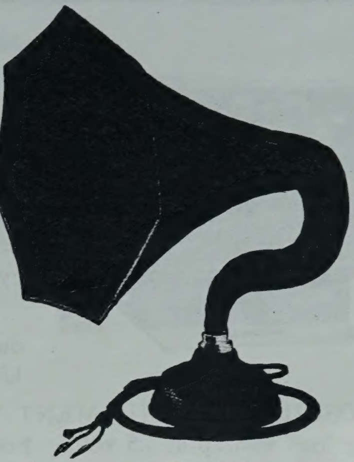
PLEIOPHONES

An audible telephone designed for residence use.

Where sufficient amplification is used to insure good signal volume the Pleiophone may be substituted for the head telephones and signals will be clearly audible throughout a room of moderate size.

No extra batteries required.

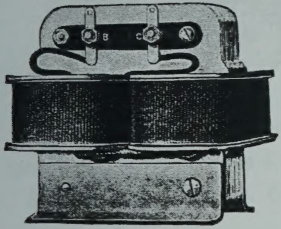
No. 401	Pleiophone	each, **$18.00**
No. 406	Large petal type horn only	each, **8.00**



No. 401

FEDERAL TRANSMITTING APPARATUS

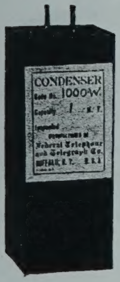
FEDERAL'S ability to design C. W. transformers, condensers, choke coils and microphones around the well-known **FEDERAL** high-grade exchange equipment enables the experimenter to secure long-lived, and efficient instruments. The rugged construction and workmanlike appearance of such apparatus is quickly apparent to discriminating purchasers. The liberal **FEDERAL** Guarantee, as explained on page 2, assures the user of satisfaction.



FILTER COIL

In order to smooth out the pulsations in the D. C. Supply, to keep the D. C. constant when modulating, and to prevent the high frequency from getting into the power transformer or generator, it is essential to employ a choke coil of proper design. The **FEDERAL** No. 300-W 1.5 henry Filter Coil has a capacity of 800 milliamperes, and is highly recommended for use with both transformer and generator plate voltage supply.

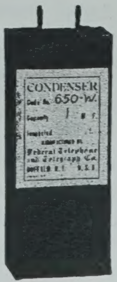
No. 300-W	Federal Filter Coil	each, **$7.50**



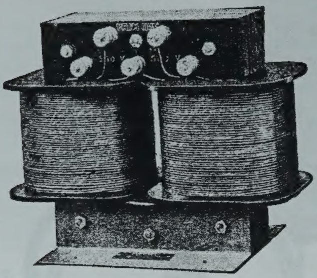
FILTER CONDENSERS

These Condensers are especially designed for use in C. W. high voltage circuits to smooth out the fluctuations, and are guaranteed to withstand the direct current potential specified.

No. 650-W.	Tested to 650 volts (D.C.)	Capacity 1 m. f.	each, **$1.65**
No. 1000-W.	Tested to 1000 volts (D. C.)	Capacity 1 m. f.	each, 2.00



500 WATT C-W POWER COMBINATION TRANSFORMER



The **FEDERAL** No. 315-W 500 Watt C. W. Power Combination Transformer is designed to economically replace the usual motor generator set as a source of supply for plate potential. With the **FEDERAL** Filter circuit and two rectifier tubes it furnishes a dependable source of high voltage D. C., also a source of supply for oscillator and detector tube filaments. Primary, 60 cycle, 110 volts.

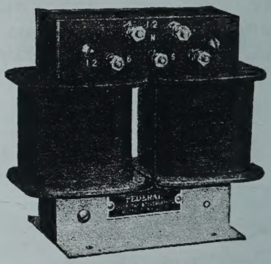
PLATE WINDING: Output 250 watts, 1160 volts between outer wires, under load, midtap at 580 volts. Equivalent of 6 UV-202 tubes may be supplied.

OSCILLATOR FILAMENT WINDING: Output 125 watts, 11 volts between outer wires, under load midtap at 5.5 volts. Four UV-202 tubes may be supplied.

RECTIFIER FILAMENT WINDING: Output 125 watts, 11 volts under load. Four Kenotrons or equivalent may be supplied.

No. 315-W FEDERAL 500 Watt C-W Power Transformer ....each, **$32.00**

150 WATT FILAMENT LIGHTING TRANSFORMER



The advantages of A. C. over storage batteries for filament heating in C-W circuits are well known. Convenience and low cost of operation are features of the **FEDERAL** No. 311-W 150 Watt Filament Lighting Transformer. This transformer has two windings, so that both rectifier and oscillator tube filaments may be heated. Oscillator Filament winding has a midtap.

Oscillator and Rectifier Filament winding—75 Watt output.
(Both windings alike)

Terminal volts—11 volts under load.

No. 311-W FEDERAL 150 Watt Filament Lighting Transformer ....each, **$15.00**

CURRENT POWER SUPPLY CIRCUIT

M 300-W Filter Coil, N 1000-W 1 M. F. Condensers, T 315-W Power Transformers, Z Rectifier Tubes, E 110V 60 Cycle **A. C.**

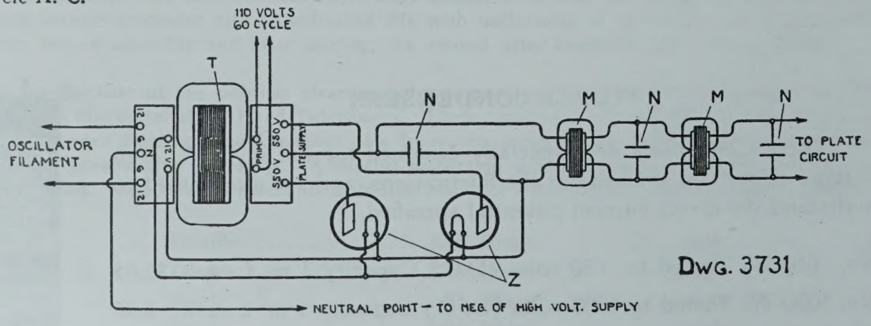


DIAGRAM SHOWING CONNECTIONS FOR 315-W TRANS.

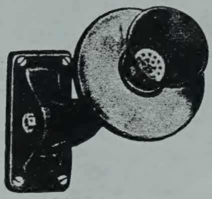
RADIO MICROPHONES

No. 260-W

Hand Microphone Set

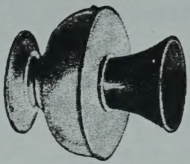
No. 261-W

Desk Microphone Set



No. 262-W

Panel Mount Microphone Sets



No. 263-W

No. 264-W
Micro-Telephone
Combination

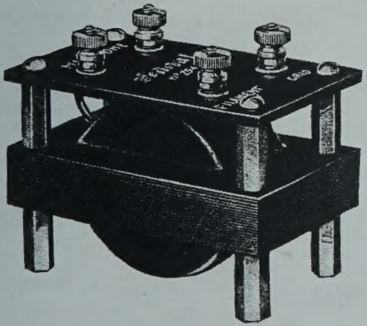
FEDERAL RADIO MICROPHONES are the result of extended research to produce the most efficient microphone for radio telephony.

No. 260-W HAND SET—Exposed metal parts, nickel plated and highly polished; hard rubber corrugated handle. convenient hook for hanging up. By using this set, you will always have the microphone in proper position on account of the novel shape and position of the mouthpiece. Fitted with 6 foot cord.
Each **$7.00**

No. 261-W DESK SET—Pedestal and base black enamel. Microphone face plate polished nickel. Fitted with 6 foot cord ....each, **$6.50**

No. 262-W and No. 263-W—For panel mounting. Both are adjustable. No 262-W, black japan pony arm. Nickel polished microphone. No. 263-W full nickel polish ....each, **$5.25**

No. 264-W COMBINATION MICRO-TELEPHONE — An ideal Combination, comprising a high wound telephone receiver and microphone. Switch in handle for operating a magnetic send and receive aerial switch. Equipped with 6 foot, 6 conductor cord ....each, **$14.00**



MODULATION TRANSFORMER

The **FEDERAL** No. 254 Modulation Transformer supersedes our former No. 236-W. This improved instrument will produce maximum possible volume with exceptionally good tone quality. Especially designed for interconnecting carbon button microphones of 30 to 250 ohms to the grid cricuit of vacuum tubes. The same high quality of distortionless performance of our No. 65 A. F. Amplifying Transformer exists in our new modulation transformer. From 100 to 200 milliamperes may be safely passed by primary.

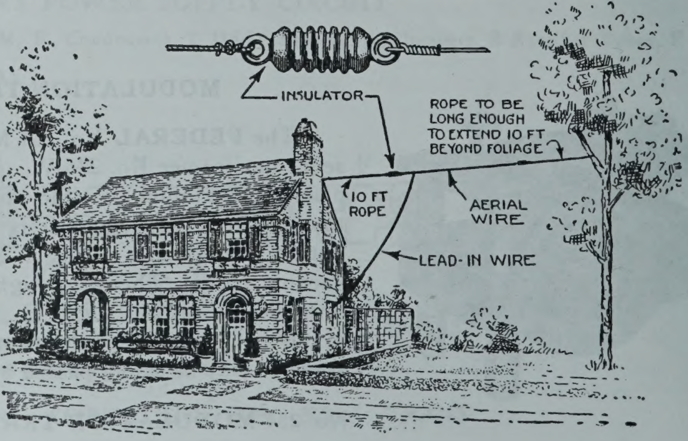
No. 254 MODULATION TRANSFORMER .....each, $7.50

ANTENNAS

In the installation and the operation of a radio receiver it is of paramount importance that the part played by the antenna in the reception of radio signals be clearly realized and that every effort be bent toward having available the best antenna. While it is a fact that with the apparatus shown in this catalogue any type of antenna from the large, long, high, outdoor antenna to the small, compact, indoor loop may be used, the smaller antenna is made possible only by the use of a higher degree of amplification than will be required if a larger antenna were used. If it is borne in mind that the antenna merely serves to intercept the energy of the radio signals which are constantly passing to and fro over the surface of the earth and that the degree of effectiveness with which the antenna intercepts this signal energy and conducts it to the receiving apparatus proper is very nearly proportional to the height of the antenna, it will be easily understood that where loudest signals are to be secured, or where signals of a usable intensity are to be secured from stations at greatest distances, the antenna should be as high as possible above ground. By ground is not necessarily meant the actual physical surface of the earth, but where the antenna is supported on a metal structure the metal itself is in effect the ground, and the difference in height between the metal structure and the antenna proper is then the factor which determines the effectiveness of the antenna. Where the antenna is supported over structures either metal or of wood, or where trees or shrubbery or other material exist between the antenna and the ground, the effectiveness of the antenna is reduced by all these conditions. For this reason a careful survey of the surroundings for erecting the antenna will be well worth while if it results in the choice of the antenna location in such a way as to make it as high as possible above ground and removed from all surrounding structures, trees, etc. It is, of course, highly objectionable to have an antenna located close to other conductors, such as electric power wires, telephone lines, lightning rods, metal stacks, etc., and where the conditions surrounding the location of the antenna make its removal at a reasonable distance from such objectionable objects or structures impossible, a reduced effectiveness must be countenanced. Where the antenna is to be supported at its ends by trees or structures that in themselves are objectionable, the deleterious effect of the supports may be somewhat reduced by bringing the ends of the antenna wire proper to within 10 or 15 feet of the point of support and connecting them with the supports by means of rope, cord or other insulating material and such an arrangement will usually be found to be well worth while insofar as the effect on the usefulness of the antenna is concerned. In order, therefore, that the maximum range and the loudest signals may be secured with a given receiver, the builder of the antenna should make his antenna as high as possible and as remote from all interfering structures or masses as is practicable and having done this he will be able to get signals with less expenditure for apparatus and more particularly for amplifying apparatus than were he to sacrifice the qualities of the antenna to mere ease or convenience of its erection.

Under certain conditions, of course, it will be impossible to construct and install a good outdoor antenna; sometimes not sufficient space will be available, or perhaps no means of supporting a wire will be available, or perhaps what space there is available between the two supports for the antenna is occupied by buildings or high trees or other troublesome materials and under these conditions it will be necessary to use an indoor antenna bearing in mind the fact that these restrictions necessarily reduce the effectiveness for distance and for loudness of signals of which the receiver will be capable. The installer may then proceed to build himself an indoor antenna. This type of antenna, just as the outdoor type of antenna, will be more effective the greater its height above the ground and the less there is of interfering materials between it and the ground. Where an attic or other open space is available at the top of a house, the antenna may be supported on the rafters of such an attic or on the ceiling of the rooms, four or five wires the length of the house being sufficient to give the best antenna that one has a right to expect under these limited conditions and when such an antenna is used, particular care should be taken to keep the conductors, which constitute the antenna, away from metal, such as gas pipes, water pipes, electric wires, metal rain gutters and leader pipes.

The receiving apparatus will almost invariably be located at a level considerably lower than that of the antenna and in order that the greatest effectiveness may be obtained, the wire connecting the antenna and the receiver should be as short and as direct as possible. When an outdoor antenna is used, the wire which connects it with the receiver, commonly termed the lead-in wire, should enter the house directly above the receiving equipment, and drop down in a straight line to the receiver, if that is at all possible. Where an indoor antenna is used, to bring about this short lead-in wire is usually more difficult, but it may very often be concealed within the walls of the room or lead directly through the floor so that it constitutes almost a vertical straight line from the antenna to the receiver and if pains are taken to secure the shortest possible length of lead wire any given antenna will, undoubtedly give the loudest signals.


INSULATOR
ROPE TO BE LONG ENOUGH TO EXTEND 10 FT BEYOND FOLIAGE
10 FT ROPE
AERIAL WIRE
LEAD-IN WIRE

For these two types of antenna in which the antenna proper is not less than 35 feet from the ground